

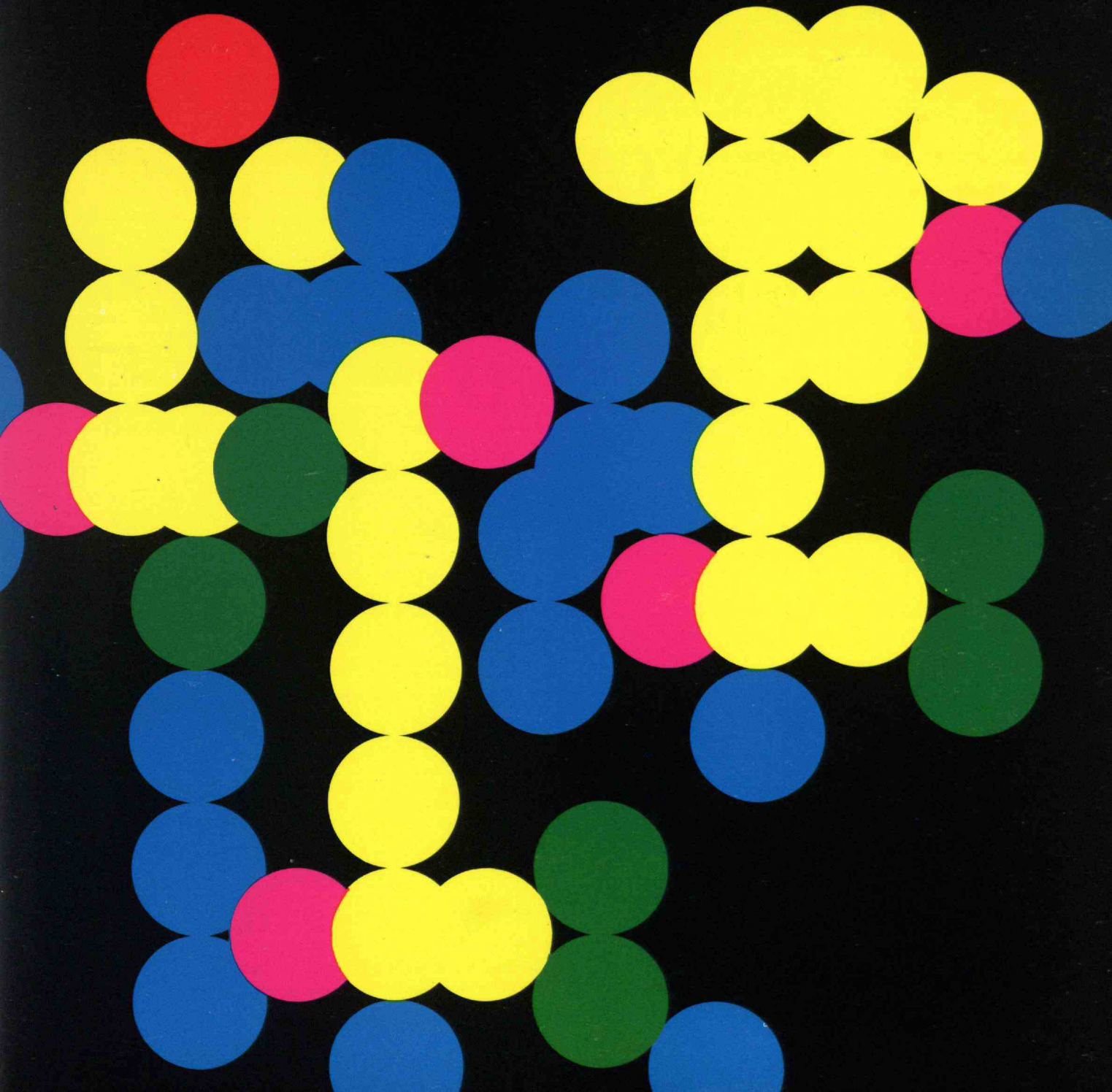
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A special issue on world protein malnutrition, its
effects, and the possibilities for its eradication:
Moises Behar, William H. Sebrell, Jr., Nevin S.
Scrimshaw, Alan Berg, and Max F. Millikan



Technology Review

The Protein Problem



technology review

Published by MIT

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The First Line

There are many superficial things to be said about the activists among today's young people. It is tempting, for instance, to dismiss their capers as self-seeking publicity: if nobody paid any attention to the kids, they would go away. Or to place the whole responsibility upon one ill-starred military mission: if the war in Vietnam were over, our problems would be ended with it. Or to assign all we see to the new powers and continuing immaturity of our youth: if we can wait for them to grow up, they will suddenly become square again, like the rest of us. Or to conclude that the activists are simply starry-eyed revolutionaries seeking to capitalize upon any point of weakness in the fabric of a university, or of a society, to prove the uselessness of the whole.

The case for understanding is not helped by rhetorical questions rhetorically applauded. Or by the student activist who, in a formal session of the American Association for the Advancement of Science in Boston in December, is so little in command of his facts as to accuse M.I.T.'s Jerome B. Wiesner of representing the interests of the Pentagon instead of the people on the A.B.M. Or by another who, at the same meeting, cited development by I.B.M. of the System 360 computers as an example of planned obsolescence.

Beneath this facade lie more serious issues. For this is a world of multiple frustrations: increasing comforts for many—but not all. Increasing understanding—but continuing stupidity. Increasing affluence—but growing poverty. A vast computer system for scheduling classes on Registration Day, but a 50-foot line in which to stand to pay tuition.

Indeed, we are surrounded with irrationalities, many of them indefensible, many of them the consequence of the power over his environment which technology has given man. Is it enough that science now warn us of the crucial dangers of squandered resources and polluted environment—and, having done so, retire again to await the fairer wind of understanding and money? Clearly

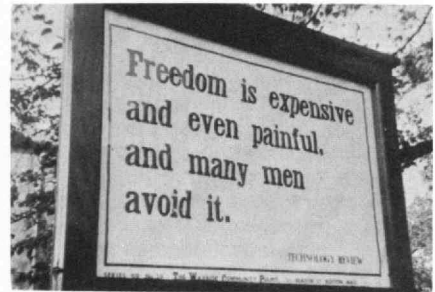
not. The message of our thoughtful young people today is that scientists are privileged members of society, and with privilege comes obligation.—J.M.

Wedgwood—Bradwood

The proprietor of Bradwood, Ltd., who advertised in *Technology Review* for June, 1968, a Wedgwood Medallion of the Great Seal of M.I.T., has defaulted on delivery and is now under indictment on mail fraud. Readers of the *Review* who responded to this advertisement and who have not yet identified themselves to the *Review's* editorial offices are asked to do so at once, outlining the nature of their grievance.

On Avoiding Freedom

The *Review* notes with interest that a phrase from Leonard J. Fein's essay on "The Costs of Freedom or a Sea of Flame" (*January, 1968, pp. 16-23*) has been chosen for the Wayside Pulpit by the Unitarian Universalist Association (*see below*).



Next Month

For March, 1969, *Technology Review* announces three papers on the problems of privacy consequent to the increasing use of computers in processing the data of our daily lives; a special report on the scientific objectives of the U.S. Antarctic program in astronomy, meteorology, and geology; and a unique proposal for research on the conditions of a stable economy instead of an expanding one. The authors are Robert M. Fano, Ford Professor of Engineering at M.I.T., and two of his graduate students; Louis O. Quam, Acting Head, and his associates in the Office of Polar Programs in the National Science Foundation; and Jeffrey Ingram, formerly of the Sierra Club, now of the M.I.T. Alumni Fund.

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Nutrition shares a complex relationship also with international economic conditions

The papers by Dr. Béhar, Dr. Sebrell, and Mr. Berg were presented at the International Conference on Amino Acid Fortification of Protein Foods held at M.I.T. last September. The entire proceedings of the Conference will be published shortly by the M.I.T. Press. Dr. Scrimshaw's paper is excerpted from a longer piece published in *Man, Food and Agriculture in the Middle East. Centennial Symposium Proceedings, Faculty of Agricultural Sciences*; edited by T. S. Stickely, J. A. Asmar, A-R Saghir, N. Atallah, and P. Pellet; and published and copyrighted by the American University of Beirut.

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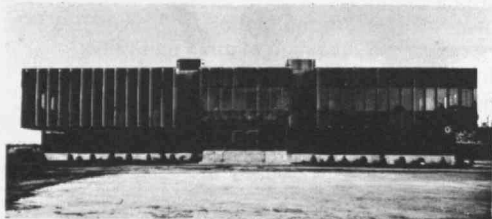
One of the worldwide leaders in management training introduces its two new training centers in Burlington, Massachusetts and Fort Washington, Pennsylvania. The first two buildings of their kind, they are prototypes of 22 other Management Centers to be built in major cities around the world. Construction on Chicago facilities will begin shortly.

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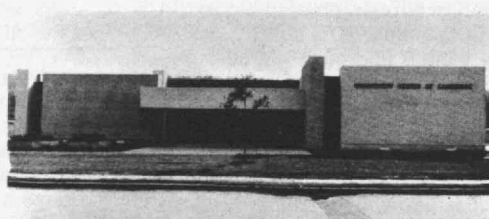
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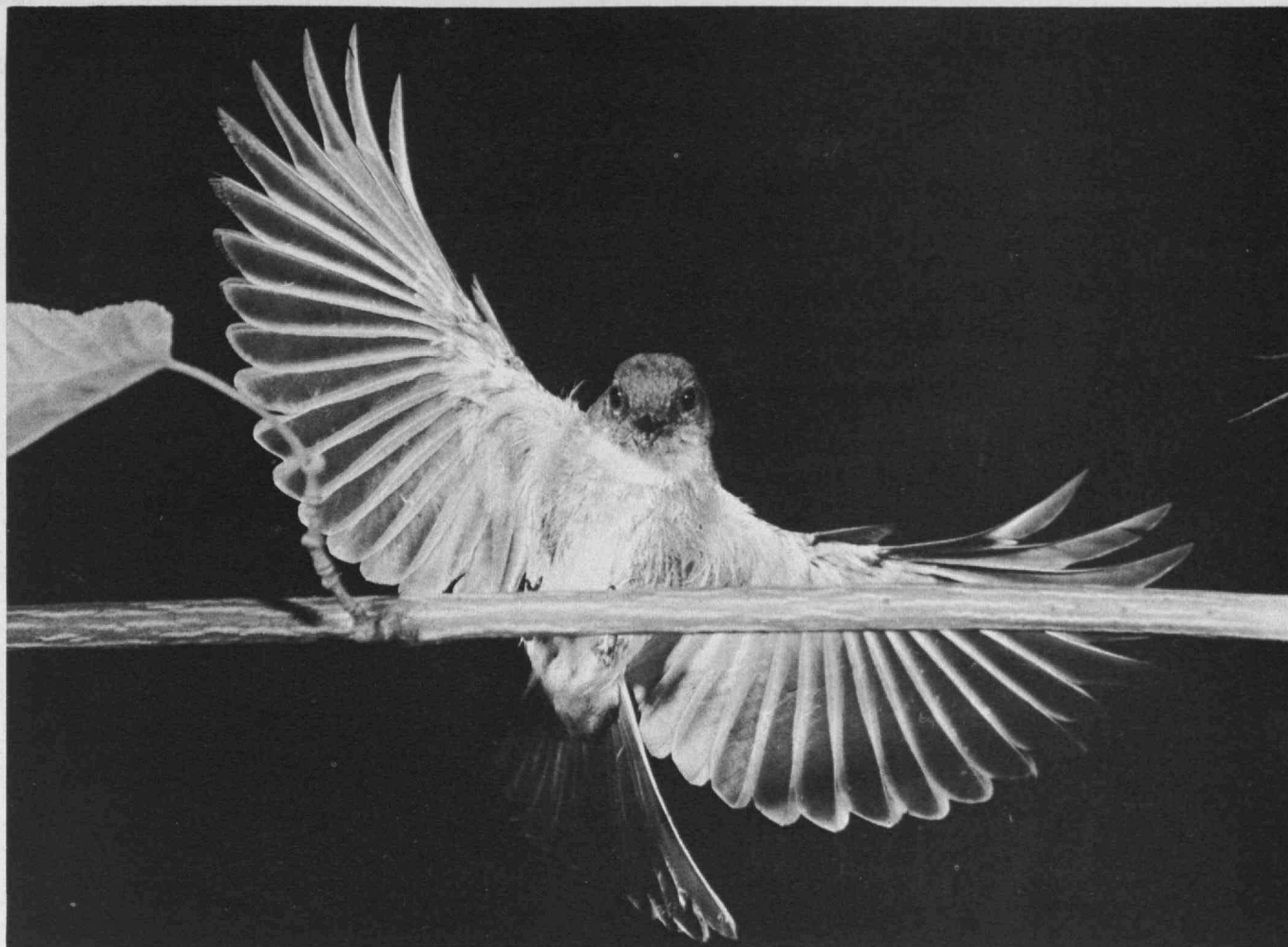


Photo by Richard Borden

A perfect flight system with no propulsion-airframe integration problems

The United States Air Force has recently announced that it will proceed with the development of the F-15 advanced tactical fighter aircraft. The F-15 development will result in a high-performance tactical system with excellent capabilities in terms of maneuverability, acceleration, and weaponry.

The tactical effectiveness of new aircraft weapons systems requires careful attention, in the design and development phase, to overall integration of the inlet, engine and exhaust of the air-breathing propulsion system. During the last two years, NREC has devoted considerable attention to the prediction of engine component performance under transient inlet conditions. This work has been conducted with the aim of eventual development of propulsion system con-

trol concepts which will allow and provide for the optimum performance of an aircraft system during both steady-state and transient conditions.

NREC is applying its experience in compressor aerodynamics and computer technology to the investigation of engine compressor and fan response to both steady-state and dynamic distortion. Corporate experience in combustion, acoustics, and mathematical modeling is being directed toward an understanding of unsteady combustion phenomena in duct burners and afterburners.

To obtain more information on our aeropropulsion capabilities, write to the Marketing Department, Northern Research and Engineering Corporation, 219 Vassar Street, Cambridge, Massachusetts 02139, or call 617 491-7270.

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What you need to fly 20,000 dragging a bomb on a 500-foot exploring for nickel.

Sound involved? It is.

Exploring for nickel is complicated and expensive.

To start it fast and efficiently, you start in the air.

You dip into your pocket and come up with over \$300,000 for a plane you'd feel safe in flying 20,000 miles a year—at an altitude of 500 feet—going 120 mph.

Then into your pocket again for another \$200,000. That's what it will cost you to modify your plane and install equipment you'll need to locate nickel if it's around.

The bomb is like a microphone. You let it dangle from a 500-foot cable. The sensing devices inside detect mineral deposits on the ground and relay the information up to the electronic equipment in the plane.

To be effective, it's got to be close to the ground. So be careful. If it gets snagged in an unusually tall tree, you're in trouble.

Of course, once you've acquired all this expensive equipment, you'll want to go to where the nickel is.

One of your best bets would be northern Canada. So dress warmly and bring lots of supplies.

Up there it gets down to 40° below,

and you won't find many towns around.

You've got the equipment and you know where to go. Now you'll need men. Well-trained, experienced men.

If you can get five like the ones pictured below, that would be ideal.

From left to right they are: Trevor Blachford, data processor. Randy Dutchburn, navigator. Heikki Limion, group head. Bob Veale, pilot. Paul Wessler, equipment operator.

Bob, Paul and Randy work the plane hunting for the nickel.

When they land, they turn their electronic readings over to Trevor for interpretation.

Heikki, who is a geophysicist, studies the information looking for indications of possible nickel deposits.

Eliminate even one of these men and you've hurt your chances of finding nickel.

Well, that's it. Except for one thing.

Once you've found an indication of nickel, your work is just beginning.

You'll have to have experienced men to go in on the ground and examine the area. Then you'll have to send in more men to drill hundreds of holes for your evaluations.

So be patient. This takes a lot of time.

If the findings turn out negative, don't be discouraged. That's how it

goes—99 out of 100 times.

But if, with a combination of effort and knowhow (and a nod from Lady Luck), you happen to find a worthwhile deposit of nickel, there are a few things you'll need to know: like how to mine it, process it and get it to market.

Before we give you that information, there's a couple of things you'd better check on.

Like putting your hands on a few dozen million dollars and a few thousand workers.

Once you've got these two things worked out, you're ready to tackle the big problems.

Nickel helps other metals resist heat, cold, impact, pressure, abrasion, corrosion... to advance engineering in vital fields—power, desalination,



miles at 500 feet in 40° below, cable at 120 miles per hour

electronics, transportation, aerospace.

We're doing everything we can to produce more nickel. Searching around the world—Indonesia, Australia, Guatemala, Canada. We've found ways to extract nickel from ores thought too poor to mine a few years ago.

We count our blessings and respect our surroundings. From nickel ores, we recover platinum, palladium, twelve other commercially useful elements. We use iron pellets for steel. Convert smoke from stacks to chemicals for other industries. On sand left from processing, we grow meadows of hay.

We are explorers. We're in 18 countries. Miners, researchers, market makers. We bring opportunity to

underdeveloped lands, new technologies, new payrolls, new tax income. Nickel in the ground is useless. We put it to work.

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To Move Away From Fear

Robert E. Boote has a point: If you're pessimistic about man's ability to solve the environment problem, you might as well cash in your chips. Your pessimism amounts to lack of faith in humanity's future.

As Mr. Boote, Deputy Director of Britain's Nature Conservancy, puts it, "It's fatal to say, 'In 300 years men may be able to achieve balance with their environment or may never come into balance with it at all.' If you take the point of view we're going to fail, all else will be of no avail—solving racial tensions, eliminating war, and so forth. Destroy our environment and you won't survive."

So as Europe plunges into European Conservation Year 1970 (E.C.Y.), Mr. Boote and the other organizers want to get across the "simple message" that: "we have to succeed (in curbing population, disciplining pollution, making earth a healthy place to live) because failure is not an entertainable proposition, and today's half-hearted bumbling along is failure."

Indeed, the E.C.Y. has come along in time to symbolize a new phase in environmental thinking. The 1960's were the decade of the environmental Jeremiahs, the prophets of gloom and doom trying to arouse man to his predicament. The mood of the '70's will probably be closer to the tenor of Mr. Boote's thinking. It will reflect a growing desire to get on with tackling the environment challenge, appallingly difficult though it may be. And this emerging commitment is making both idealists and hard-headed experts face up to our crippling ignorance about the whole environmental business.

We don't really know how we're polluting the environment. We don't know how the biosystem functions. We don't understand the implications of so-called "technological progress." We don't even know how many people would be an ideal population for a country or the planet as a whole. So one of the biggest challenges of the 1970's is to find out what the heck we're talking about when we wring our hands over "the environmental problem."

What Are We Doing Wrong?

An American Chemical Society task force ran into this in trying to assess man's chemical assault on his home planet. Its report *Cleaning Our Environment: The Chemical Basis for Action* is a long list of fields in which solid scientific information is needed. Authorities look at America's eutrophic Lake Erie or Switzerland's Lake Zurich and eye fertilizers and detergents. Perhaps the phosphates and nitrates these put into the waters do cause the oxygen-depleting overgrowth of algae that kills lakes. But the A.C.S. committee under Dr. F. A. Long of Cornell University couldn't find enough data to pin the blame. Nitrogen/phosphorous concentrations vary widely in eutrophic lakes. Perhaps other culprits are involved. It could be self-delusive to go after fertilizers or detergents blindly.

The current crack-down on DDT and related pesticides may alleviate some environmental poisoning. But, here again, the A.C.S. study points out that we've scarcely begun to trace the extent of pesticide pollution or evaluate long-term effects of low-level pollution on animals and men. If pesticide bans are a substitute for the extensive research needed in this field, they will merely delude us with false security.

Or take air pollution. What is the effect, if any, on Americans of the 86 million tons of carbon monoxide their cars put into the air each year? Of what significance is it that air-borne sulphur dioxide is raising the acidity of European rain water and lowering the pH of some of its lakes? What little we do know about air pollution has been wrung out of scanty data, as the A.C.S. report puts it, "in the teeth of formidable scientific odds."

Quite clearly, governments are going to have to take the need for wide-ranging research on pollution seriously if they are to come to effective grips with the problem of curbing its bad effects on our world.

We're equally badly off in dealing with "overpopulation." How easy it is to judge there are too many people in India where people outrun their food supply. But how many people would be "best" for the United States, Britain, the Soviet

Union, or Brazil? Nobody knows, and nobody even knows what criteria to use for such a judgment. A symposium on "the optimum population for Britain" held last September by the Institute of Biology made this painfully evident. Attendees voted 131 to 15 for a motion saying Britain is already overpopulated. But no one at the meeting cared to stick out his neck and say how people the country should have.

Mr. Boote likes to cite this meeting, which he helped organize, to illustrate our rather vague approach to population. We know that unrestrained population growth can be disastrous. But overpopulation is more related to our technological abilities and the carrying capacity of the land as we use it than to some magic number. In countries like Britain, the feeling of too many people has more to do with London tensions and car-packed roads than with numbers as such.

What we need, Mr. Boote says, is to "seek to control our numbers to some optimum level, related to many standards and criteria. . . . The level sought would be at the highest economic or material well-being compatible with retaining and enhancing long-term resources—such as healthy land, clean air, pure water, wildlife, and living space for work and recreation . . ."

As man's understanding of planetary management matures, as his technical powers grow, the "optimum" population will change. "What we need to understand are the criteria people will use to determine what is the optimum population at any time and for any generation. Don't freeze it at any given number. But at the same time slow down the population explosion to give ourselves a breathing space to determine how we want to grow."

Here again I think Mr. Boote is right to emphasize the need for a shift in attitude. It would be just as hard to slow population growth while deciding where we want to go as to slow it merely out of fear of its consequences. But it would focus attention on the real objective. It would emphasize our need to learn to manage our planet and ourselves so



"To believe that men won't change their outlook (on their environment) is tantamount to assuming they are doomed as a species on this planet." (Boston on

October 16, 1969—an aerial photograph by Henry W. Kendall, Professor of Physics at M.I.T., for the Union of Concerned Scientists)

that man can go on living on earth for many thousands, perhaps millions of years. It would exchange a negative concern with "the population problem" for a positive effort to build for posterity.

Also, the so-called "overpopulated" countries are getting a bit fed up with being lectured at by better-off nations that pay scant attention to the growth of their own resource-hungry people. To recognize that working out a rational population policy is a world responsibility would put things in better perspective.

An Extension of Ethics

In dealing with the environment, though, the most important change of viewpoint has to come in the hearts of individual men and women. We are being challenged to trade in our historic callousness for genuine love of our earth. We are being challenged to establish a climate of opinion in which governments and industry will be spurred to tackle environmental matters vigorously.

Certainly, population control calls for a radical new outlook on the part of individual men and women. Reversing environmental decay demands an equally profound change. As the A.C.S. report notes, this will put a cost on all of us in higher taxes and prices. We will bear this cost only if we come to value a clean environment for its own sake. And that includes putting a present value on the future environment that we hand on to our descendants.

The pioneer American ecologist Aldo Leopold outlined this new ethic some time ago when he said: "That land is a community is the basic concept of ecology, but that land is to be loved and

respected is an extension of ethics. We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect."

This "extension of ethics" is what the European Conservation Year is all about. It's a frankly propagandistic effort to awaken individual Europeans to "love and respect" their environment. Member countries of the Council of Europe, which sponsors E.C.Y., are having a variety of "events" throughout 1970—lectures, countryside tours, and so forth. Just as this column appears, top officials and experts from these countries will be surveying the European environment during a week of discussions at Strasbourg, February 9 to 12.

No one expects any far-reaching solutions to Europe's pollution and sense of crowding to come out of the E.C.Y. discussions. But if the year can promote more sense of responsibility for the environment, it will have accomplished much. For men have the technical power to solve their environmental problems if they also have the will and vision to do it. Thus Mr. Boote says E.C.Y. wants to move away from the environmental pessimism of the past. This has discouraged people rather than spurred them to rethink their relation to nature. The prophets of doom have served a valuable purpose in waking up at least some people to environmental dangers. This, in its way, was positive. But the pessimism that's gone with it is something else again. It has more to do with assessments of men's readiness to changing their attitudes than with inherent technical difficulties in meeting

the environmental threat. To believe that men won't change their outlook is, as Mr. Boote points out, tantamount to assuming they are doomed as a species on this planet. It's pure and simple fear. "We've got to move away from fear," says Mr. Boote, adding that he already sees "a tremendous upsurge in care and concern." Our twin needs now for effectively meeting the environmental challenge are a scientific understanding of its nature and a genuine concern for our world. There is no real reason to believe that men will fail on either count. Indeed, there are signs that both needs are beginning to be met. "Man," Mr. Boote says, "is going to be a more important factor than people give him credit for. And he's going to take command of this situation." That could well be the environmentalists' motto for the 1970's.



Robert C. Cowen, who is stationed in London as Science Editor of the Christian Science Monitor, writes regularly for Technology Review.

On the 100th anniversary of *Nature*, its Editor believes he must say explicitly "that it remains an honest objective to win for science, not merely a 'more general recognition in education and daily life' (which the founders of *Nature* proposed) but also an opportunity to change the world."

Science Is What Men Make Of It

One hundred years ago, in the public advertisement of the objectives of *Nature*, the founders declared that they wished to "place before the general public the grand results of scientific work and scientific discovery; and to urge the claims of science to a more general recognition in education and daily life" as well as to create a means of rapid communication among scientists.

With such ambitious marching orders, it is understandable that *Nature* behaved as if it had a license to comment on anything and everything. The importance of education, for example, has been for the whole of a century one of the most sustained streams of comment. The disposal of garbage, pollution of the air, and the management of the Royal Society are some of the issues which occupied as prominent a place in the 1860's as they do now. Cementing this torrent of opinion together was a robust view of the rationality of science.

How did Norman Lockyer, as first Editor of *Nature*, manage to satisfy the interests of both scientists and laymen? It is only half an answer to say that the rigors of modern professional science had not then made their appearance. At the beginning, *Nature* spoke with two voices, one of them clearly directed at the interested bystanders. The short answer is that *Nature* survived its first years by sheer journalism. So honest was its concern for the mutual interests of contributors and readers that its gaucheries were not offenses but, rather, proofs of vigor. By the end of the 1930's, *Nature* had become a means of communication among scientists and a learned journal as well. Almost by magic, it also remained a means of placing "before the general public the grand results of scientific work and scientific discovery," even if the going was at times a little hard.

A part of the reason was the urbanity of the contributions to *Nature*. A glance at some of the best of them will show that it was quite recently possible for people to communicate important news in a few brief paragraphs of simple prose. To be sure, these tales are not complete—"full details will be published elsewhere" was the standard cry. They are, however, and

were, widely intelligible to unspecialized readers. By resolutely skimming the cream off the top of the scientific literature, and by insisting on an economy of exposition for which few other journals dared to ask, *Nature* was able somehow to bridge the gap between professionals and amateurs.

Must Science Be Uncommunicative?

Much of the period since World War II has seen a running battle with the growing specialism of professional science. Scientific communications have become harder to understand, partly because of the language in which they are written and partly because of the conventions, laudable no doubt, which seem to require that authors should communicate not merely news of discoveries but also a tale of how they might have been made which is sufficiently plausible for somebody else to repeat the work. Second, scientific communications tend now to be addressed to narrower audiences than in the past. It is an urgent question, not merely for scientific journals like *Nature* but for scientists and for their public, to know whether these tendencies are avoidable.

The decline of literary standards in science is conspicuous. The most charitable explanation is that there has grown up a convention that authors should not seek unfairly to enhance the value of their work by describing it in language that can be followed easily. But even if the explanation were mere hamfistedness, the result is that communication is less effective than it might be, which in turn implies that the scientific community is less aware than it should be of its common interests and less stimulated than it might be by its corporate discoveries.

But is clarity compatible with specialization? Is it possible for ordinary people to follow the great adventures in science when jargon has become not merely a convenience but a necessity? These are legitimate questions, and there are many circumstances when they must be answered, "No!" If, for example, an astronomer has measured the position of a new supernova and wishes to let his colleagues know quickly, there is no reason why he should describe the phenomenon in any but the most technical

language; those who really need to know will understand the jargon.

These are comparatively trivial illustrations of the way in which a great deal of the common currency of scientific communication consists of the exchange of undigested data between people with a direct interest. It would be foolish to suggest that this traffic is illegitimate, or that the information-mongers should translate their information into ordinary language so that everybody can appreciate its importance. But it is also fair to raise the question whether information of some new development which is only communicable from one specialist to a colleague with similar restrictions can be a discovery in the broader sense of the word. For a hundred years, *Nature* has stuck fast to the positivist doctrine that discoveries are only discoveries when they are recognized as such outside the circle in which they are first made. There are many who will protest that this doctrine is at once too fierce and too shallow, but that is beside the point. If this is what Mr. Marshall McLuhan means by "the medium is the message," it is one of the few occasions on which he may be right. Discoveries count only when they are insinuated into the minds of others.

There is a variety of reasons why this principle has too often been neglected in the past few years. In many fields of science, data-collecting has become easier than interpretation. There is a tendency sometimes to equate measurement with understanding. And there are some who even hold that interpretation and generalization, always chancy, are best avoided when a more laconic statement will suffice. To be sure, rash speculation can be as serious a misdeemeanour as cowardice. Unhappily, however, there is no escape from the everlasting dilemma of scholarship—that success entails the choosing of a narrow path between fantasy and banality.

The most immediate need is to find better ways of interpreting the rapid shifts of interest in the scientific community as reflected in each week's issue of *Nature*. In 1968, pulsars were the rage. Last year provided so much understanding of the mechanism by means of which the molec-

ular structure of genes is translated into the usable information within a cell that it cannot be long before some of those who have abandoned molecular biology for neurophysiology will be back with their mutant cultures once again. And who knows what this year will bring?

It is also evident that the task of urging "the claims of science to a more general recognition in education and in daily life," in the words of *Nature's* founders, has been complicated by the changes which have taken place in the past century. Science is no longer an autonomous organism, capable of transforming the society in which it grows but otherwise independent of it. Instead, the pace of discovery depends on public policies—government spending in universities, for example, or the spin-off from defense programs. So the cause is not merely recognition but fair play.

It is also important that science has grown so as to burst national frontiers in a way which even Davy and Faraday would not have imagined when they went on their Grand Tour at the height of the Napoleonic Wars. One striking proof of this is that *Nature* circulates wherever there are laboratories, so that two-thirds of the copies which are printed eventually find their way outside the United Kingdom.

To Emphasize the Positive

Is it worth the trouble? A century ago, when Lockyer and his colleagues embarked on their adventure, there seemed no reason to dispute the beneficent potentiality of science and technology. For the whole of a century, science and technology have been making dreams come true. Prosperity has become a reality, even if some are still conspicuously deprived of it.

So why should gloom have become high fashion? And why recently? What has happened to make anti-pollution a common rallying-point for conservationists and luddites? Why is it assumed that the growing population of the world will bring starvation—it will bring other things all right—even though food production has been increasing still more quickly?

The first thing to be said—and this is the passive defense—is that science is well on the way to being made a universal scapegoat. Just as the bearers of bad news were once executed, so the analysts who pose awkward problems are now vilified. If, for example, there should be scientists (as there are) trying to find out what has happened to cause the deaths of 10,000 seabirds off the northwest coast of Britain in October, 1969, the chances are that the phenomenon itself and not the patient investigation will somehow be laid at the door of science.

In the same spirit, if there should be somebody working hard (as many groups are) on the use of lasers for the detection of atmospheric pollution, the chances are high that success will not be counted as

a means of refining methods for controlling the quality of the environment but, rather, the vehicle for yet another demonstration that the doings of scientists and engineers have once more placed disaster just around the corner. It has become fashionable for people to ask "How is it possible to control technology?" as if the question were entirely novel and as if it were possible somehow to distinguish the technology part of the problem from the social part. The weak defense, in other words, is to protest that science has been misjudged.

The strong defense is that which seems to have come most easily to *Nature* in the past hundred years. Science and its consequences are not merely inoffensive but constructive, valuable and indispensable. Mention computers to many people, and their minds will fly to Orwell and 1984. The crying need is somehow to make them see that the other side of the coin is magnitudes brighter. Two things can help.

First, there is the common truth that intellectual discovery is always subversive and usually beneficial, if unpredictably so. Darwinism was a fierce assault on the established order, and Bishop Wilberforce was not the only one to answer back. The outcome, however, has been beneficial, not merely in ridding people of the old burdens of mystery but in making society more free to soldier on. It will be the same with molecular biology, or control engineering or the cosmology for which everybody now is waiting. There is very little trouble in writing gloomy prophecies about the way in which a little more understanding of genetic replication will make endless horrors possible, but the plain truth is that the most likely practical outcome, distant though it may be, is a betterment of medical practice. In the meantime, it will assist everybody, not merely professional biologists, that there is a means of putting in the objective language of molecular biochemistry the important truths about living substance.

Second, there is the safeguard which comes about because of the way in which the progress of science and technology is molded by the restraints of the

society within which it develops. In a sense, it is entirely welcome that scientific discovery is no longer an autonomous process on which the outside world has very little influence. With the enormous growth of the scale of scientific enterprises, it is inevitable that the directions of discovery should be in part determined by the wishes of the taxpayers. This is the spirit in which high-energy physics has recently become unfashionable both in Britain and in the United States. In much the same way, it seems as if public distaste for chemical and biological warfare is beginning to restrict even the development of preparedness. This is as it should be, and yet another way in which it is possible to hope if not to count on the certainty that the potential excesses of science and technology will be combated and probably headed off by the humane instincts of liberal societies. In short, there is no need to pretend that science is always safe. It is enough to know that it is what ordinary people wish to make of it.

At this occasion in the domestic history of *Nature*, it is important to say explicitly that it remains an honest objective to win for science not merely a "more general recognition in education and in daily life" but also an opportunity to change the world. Africa may be cruelly balkanized, but is there any doubt that the eradication of the gulf between rich and poor nations will eventually be brought about with the help of research now under way in a host of laboratories? Immortality is beyond reach, but sound health is not. And if omniscience is unattainable—that is half the fun—continuing enlightenment is not. That is something to work for in the century ahead.

John Maddox, an experienced journalist and physicist, has been Editor of Nature since 1966. This essay is adapted from his editorial comment ("Is It Safe to Look Back?") in the centennial (November 1) issue of that distinguished British journal.



A WEEKLY ILLUSTRATED JOURNAL OF SCIENCE.

*"To the solid ground
Of Nature trusts the mind which builds for aye."—WORDSWORTH.*

What was new during the 1969 version of Americas' largest general science convention was a high sense among the scientists themselves of "urgency and political and human reality . . . It became clear that most scientists are willing to vote for some national austerity to pay for . . . man's survival."

Science's Sharpening Conscience

Science in the 1970's faces wrenching changes. Most of them involve issues that need to be resolved in Washington. But one pressing issue has to be resolved by every man for himself: that of technology and morality. In a nutshell, whether scientists, technologists, and academics can any longer get away with saying, "We only invent the world. We're not responsible for it."

This issue became painfully plain during the last week of the 1960's, as the American Association for the Advancement of Science met in Boston. This was a sobering—not a cheerful—meeting, looking back on a decade of killing and anger and saying as the calendar turned, "Where do we take science next?"

The kids were, of course, jarringly present, heckling, jeering, sloganeering, defying their patrimony and sometimes stating the embarrassing truth. Such as one young man, long-haired, shrill, desperate: "You scientists are too damned neutral! You make medicines, you make missiles. Then you say you're not responsible."

"Science for the people," the kids shouted. "Science is in a sorry state." "You've helped make the mess."

And the hopeful thing was that to a surprising extent their elders agreed. Speaker after gray-haired speaker passionately testified: "Human society is now entering a crisis of survival" . . . "Blind use of technology is the mark of our time" . . . "The waters are rising, and we have no tools to build boats." The last from the White Goddess, Margaret Mead, on the state of population and pollution.

Population, Priorities, and Responsibility

The gray-hairs in fact were ahead of the kids, for they offered some thoughtful analyses and possible programs. No one presented "solutions"; no one is so naive as to hope to solve man's major troubles. But the waters at least must be stayed, the 40-, 50- and 60-year-old protesters said; alternatives must be examined. What was new at this A.A.A.S. meeting was not so much the subjects themselves as a high sense of urgency and political and human reality. You can't ignore a kid waving a banner saying, "Redirect society to redirect science"—

not unless you're Dr. Dunderhead, of which there were only a few.

What was also new was much agreement on three trends that, if they flourish, are certain to lead to political action:

Measuring the "Optimum" Population

1. Scientists, even if only partly prepared, must start to put some numbers on humankind's pollution and population crisis. The two problems are one: increasing population will inevitably swamp the best anti-pollution efforts.

The authorities at this meeting were asked, therefore, to try to answer the inescapable question: Is there an "optimum population level," a level at which man can be both prosperous and sort of content? In other language, at what point in world population growth does mankind, if it wants to survive, somehow have to blow the whistle?

"Pure" scientists dislike answering questions without data, and for this question there is no dependable data. But several of the speakers agreed: the optimum population limit has already been passed. We have already reached the point where, in the words of Dr. Preston Cloud, University of California geologist, "growth is a villain, not a success symbol."

In fact, said Dr. Barry Commoner of Washington University, world population at 3.5 billion is already so large that, no matter what we start doing today, it will inevitably double by about the year 2000. This point, he maintained—admitting this is "a wild guess"—may well be the crash point, the point at which the ecosystem can no longer cleanse and restore itself. "We may be able to grow food for more people. But it seems quite probable that, at about this point, doing so will so strain the system that it will break down. And some essential parts—like certain bacteria—may be so strained they will never come back. Man will have had it."

Impressed environmentalists in Washington are already planning further examination of the "optimum population level" concept, first on a national, then on a world scale.

There were neither resolutions nor youth-

ful demonstrations at the A.A.A.S. meeting on the subject of over-population. But there was clear leadership by the grayer heads in stamping this, too, as a moral issue. A master at getting to the heart of things, Miss Mead urged scientists to formulate "a planetary ethic" to make the idea of an arbitrary and controlled birth rate acceptable to all peoples.

There has been a good deal of talk recently to this point. Dr. Roger Egeberg, Assistant Secretary for Health and Medical Research of the Department of Health, Education and Welfare, recently said women may have to accept the fact that having more than two children per family is immoral. In a country like the United States, this may have some effect.

But Dr. Commoner pointed to a broader demographic fact, a fact sociologists and others have stated before: in countries where population has leveled off, there have first been (1) high food production and growing national productivity, and (2) decreasing mortality, so people can feel "a sense of security," and not think it necessary to spawn broods of bread-winners. In fact, thorough national social security systems have often preceded population leveling.

On the Responsibility for Decisions

2. Hearing that man is thus threatened, many scientists, professors and engineers indeed seem to have decided at this meeting: "We can no longer say we're only the tool-makers."

This feeling was by no means unanimous, however. And there was a good deal of sentiment, probably a majority feeling, that it should be applied selectively. In other words, that men of science should now make moral judgments as *scientists*, but that they should make them only on questions on which they have special expertise and information.

Accordingly, the A.A.A.S. Council voted overwhelmingly (114 to 51) to urge an immediate end to use of two herbicides (2,4,5-T and 2, 4-D) in Vietnam on the ground that their massive use there may be affecting the population's genes and maiming future generations. "In previous years, the organization would not have been willing to take formal action on a

moral basis," admitted Dr. Howard O. McMahon, president of Arthur D. Little Inc. and General Chairman of the Boston meeting. "In the past the A.A.A.S. has said, 'We're scientists, we shouldn't get involved in moral or political questions.' "

At the same time, a Council committee—after obvious consultation among the A.A.A.S.' graybeards—declined to permit consideration of a late resolution to take a stand against the Vietnam war itself. This, it was largely felt, had to remain a moral and political decision—not one in which a scientific body could claim a special voice.

It is very probable that this question is not yet decided. The same issue was faced during the Christmas week by other societies. The American Philosophical Association's Eastern Division, meeting in New York, voted for "total withdrawal from Vietnam of all American forces as soon as is physically possible"—doing so despite an emotion-ridden debate that included a plea from Prof. Aron Gurwitsch of the New School for Social Research (onetime refugee from Nazi Germany) that "the problem before us is whether a professional and scholarly organization does not become unfaithful to its destiny, to its logic, by taking a stand on political questions. It would mean the beginning of complete politicization of our organization and of all spheres of life, and this is the hallmark of totalitarianism."

The American Historical Association voted down an "immediate-withdrawal" Vietnam resolution (that also urged an end to harassment of Black Panthers and release of "political prisoners such as the Chicago Eight"). The Modern Language Association, on the other hand, passed a "sense of the meeting" immediate-Vietnam-withdrawal resolution that will be mailed to members for individual vote. If appreciable U.S. forces are still in Vietnam next Christmastime, the A.A.A.S. is almost sure to see this issue reappear.

Even on technological issues, there were antimilitant voices. There was much discussion, in several of the A.A.A.S. formal sessions, of the direction of the U.S. space program and especially of space planners' desire to mount a manned expedition to Mars. Here, one A.A.A.S. official almost incredibly argued, about the nation's priorities: "This question is not in our area of judgment. We have to do what society tells us to do."

Some man-in-space supporters, like S. Fred Singer, the physicist who is now Deputy Secretary of the Interior, maintained that "if we downgrade the manned space program," the part the public is most interested in, "we may find we don't have any space program." Carl Sagan, Director of Cornell University's Laboratory for Planetary Studies, argued that the \$3.7 billion space budget is "not the appropriate target" because it is only a few per cent of the military budget.

But the far wider feeling, as expressed by

Gordon J. F. MacDonald of the University of California at Santa Barbara—member of the space panel of the President's Science Advisory Committee and the National Academy of Science's Space Science Board—was that a program to send men to Mars soon would be "the utmost in folly," in view of the nation's pressing social and environmental needs, and the current starvation of many fields of science and graduate training.

The kids agreed. They distributed bits of rock labeled: "Mars rock, cost \$40 billion." Man-to-Mars is currently going no place in Washington, and the primary reason seems to be wide agreement that at this juncture starting such a program would be a political, economic and moral mistake.

Priorities in a Time of Austerity

3. This brought the discussion down to a matter of governmental dollars and cents: where and how much should a prosperous country like the U.S. spend to protect the ecosystem and begin to control population? Rich people like Americans, Dr. Commoner thought, will "have to give up 100-200-300-horsepower cars, the \$70-billion-a-year defense budget and 'junk culture' " to find capital to attack pollution, relieve the ecosystem and help other nations stabilize.

Just controlling water pollution, said Dr. Singer, would take around \$10 billion a year in the next five years, dwarfing present clean water budgets. (The nation now spends around \$10 billion a year on pollution control—nine-tenths of it by municipal governments, half of that just for municipal waste collection.) Some insiders say Mr. Nixon would like to increase federal anti-pollution spending to nearly \$2 billion a year. At the same time he requested only \$214 million for clean water in his fiscal 1970 budget. Congress appropriated \$800 million. To fight inflation, the Administration very likely may not spend it.

As population grows, Dr. Singer warned, the cost of pollution control—now an "acceptable" 1 per cent of the gross national product—will go up "enormously." Then, he realistically predicted, Americans will refuse to pay the environmental clean-up bills—and may be willing to pay for even less clean-up (though at far more cost) than we feebly perform now.

Already, noted Dr. Philip Lee—Chancellor of the University of California's San Francisco Medical Center, Assistant Secretary for Health of H.E.W. under President Johnson—Americans are refusing to pay the bills "for quality education and adequate health care" of the 25 million people added by the baby boom of 1947-57.

Human Welfare—Science vs. People

It became clear in the last week of the 1960's that most scientists are willing to vote for some national austerity to pay for anti-pollution and population control measures, for health and education and man's survival.

But is the public? Even while the scientists gathered, the news wires reported the final details of Congressional tax cuts and former Budget Director Charles Schultze's comment: "When the chips are down, those who talked about priorities for pollution control and education and an end to hunger voted for beer and cosmetics and whitewall tires."

Still, times are changing. If scientists continue to press for population control, morality in technology, and austerity to pay the bills, the effect could be huge.

On the other hand, said Harvard physicist Gerald Holton, "If in 1979 we are still meeting in places like Boston—smoggy, crowded with hunger and poverty and inadequate public education—then our hope that science can do anything in the promotion of human welfare will be just about gone."



Victor Cohn, a regular contributor to *Technology Review*, has attended A.A.A.S. meetings since 1948, first as *Science* writer for the Minneapolis Tribune and now as *Science* Editor of the *Washington Post*.

Can this people—despite the stridency and irrationality of its critics—achieve from its pioneering efforts in space the “new modes of thought” and “cultural exuberance” for which the astronomer Carl Sagan finds historical precedent?

Reason Under a Burning-Glass

The increasing stridency of intellectual life in the United States—and glimmerings of a resolution by both older and younger scientific idealists to unite for social goals requiring a long view of the consequences of technology—were evident at the Boston meeting of the American Association for the Advancement of Science last Christmas.

The meeting was marked by protests, many of them carefully orchestrated and some of them even included in the arrangements. Some protesters said leading scientists had not moved fast enough or effectively enough on such questions as disarmament or pollution. Others said that the scientists are too concerned with cozy persuasion of a pack of irrelevant officials in Washington. Still others said that, on balance, the activities of even those scientists who say they are working for disarmament really promoted war. And there were those who said or implied that the time for reasoned argument was past and that the time for revolution had come.

These sentiments, which reflect anxieties which range from fear and hatred of the Vietnam war to a desperate doubt that there can be any employment in the world for an idealist, were familiar to the scientists inscribed as speakers at the A.A.A.S. They have heard torrents of denunciation of this sort for several years at the universities where most of them work. But it was a surprise to have so much disruption at a national meeting dedicated to the exchange of ideas.

At first, the leading scientists who have used the A.A.A.S. for many years as a forum for warning the public about the gloomy consequences of runaway technology felt insulted and angry. It was as if the protesters, many of them openly anti-intellectual or espousing the doctrine that there are forbidden research topics, were seeking to punish the very individuals who had done the most to arouse the public's awareness of the need to do such things as halt the arms race.

Despite this, few lost their tempers. Former presidential science adviser George B. Kistiakowsky, chairman of a live-television session on disarmament where

he and others were denounced as “war criminals,” contented himself with the observation that he and his fellow panelists had nothing to apologize for and that the processes of government remained such that policy continued to be made at Washington and not by emotional outbursts in Boston. Jerome B. Wiesner, M.I.T. Provost who appeared on the same panel, threw the epithet “ignorant” at one questioner who maligned Alexander Rich, an M.I.T. biologist. When asked to repeat the words of a sign that said M.I.T. was engaged in weaponizing, replied, “I’m not a toady for you.” Throughout a much-interrupted panel on the future of the U.S. space program, its chairman, Charles Stark Draper of M.I.T., kept smiling and left the problem of silencing a chronic interrupter named Melvin Margulis to the producer of the educational telecast of the discussion.

As it happened, the A.A.A.S. itself seemed ready to take some steps which it would have regarded as too militant a few years ago. After years of urging, its Council passed resolution urging immediate suspension of the use in Vietnam of the herbicides 2,4-D and 2,4,5-T. The A.A.A.S. announced that Matthew S. Meselson of Harvard, a noted molecular biologist who has been a leader in past efforts at biological disarmament, would set up a long-term study of the effects of the use of such herbicides in Vietnam.

“The Ultimate in Folly”

The anger and desperation about important public issues was not confined to protesters. There was widespread discontent at the meeting with the continued U.S. government emphasis on manned space flight, despite an appearance by Dr. Thomas O. Paine, Administrator of N.A.S.A., in which he attempted to convince the scientists that N.A.S.A.'s major commitment of the 1970's—development of a re-usable space shuttle capable of regularly supplying a space station to be established in Earth orbit—would offer the first chance to get non-pilot scientists into space.

Gordon J. F. MacDonald of the University of California at Santa Barbara, who is on a whole string of committees advising N.A.S.A. in one way or another, accused these committees of a lack of indepen-

dence and of failing to provide the nation with a master-plan for space exploration which would lay greatest stress on those investigations promising the best information relevant to managing the environment on Earth.

MacDonald said: “It is essential at this time to examine the value of the space program to the nation. How can it contribute to the advancement of science and technology? What part of the space program can help in solving the nation's ills? What part is truly required to maintain our technological image?”

In his speech, MacDonald made it clear that he regards investigations of other planets, each one a unique environment probably impossible to duplicate in the laboratory, as keys to understanding major facts about the earth—particularly its atmosphere. But he questioned the urgency of the \$700 million Viking program to send a pair of orbiters to Mars in 1973 (now postponed to 1975) from which two soft-landers (resembling the lunar Surveyors) would be detached. That sum would pay for a year and a half of the National Science Foundation and for two Batavia, Ill., particle accelerators.

Comparing manned and unmanned investigations of the planets, MacDonald guessed that the severe automation requirements of unmanned studies would contribute more to the nation's technological strength than a manned expedition.

“Only the Future Got Murdered”

Dr. Wiesner's speech at the disarmament panel was a much angrier one. He called on President Nixon to avoid the “costly opening mistake” made by the Eisenhower and Kennedy administrations, taking over from the opposition party, in making “the next turn on the ratchet” of the nuclear arms race.

Repeating arguments that any anti-ballistic missile system is unworkable and that multiple-warhead systems are as yet untested, Wiesner called on Nixon to reverse his go-ahead on A.B.M. and M.I.R.V. before the Americans and Russians renew their strategic arms talks in Vienna in April and concentrate on using those talks for a roll-back of the existing missile forces.

For at least part of the meeting of the A.A.A.S. in Boston this winter, the students were talking mostly to themselves—and to their offspring. In this session—billed as a student critique of “the sorry state of science”—Larry W. Beeferman of the M.I.T. Department of Physics (right) attacked what he called “the myth of the technologist class”: engineers need not after all be so subservient to the nation’s ruling class; let them stop lining management’s pockets and start working for the people’s interests.



Wiesner said that Kennedy’s defense secretary, Robert McNamara, “thought he was being modest” in asking in 1961 for 950 new intercontinental missiles because the Air Force wanted 3000 and 950 “was the smallest number he could imagine asking Congress for and, in his words, ‘not get murdered.’”

Wiesner’s comment on this was, “Only the future got murdered.”

Even if the American and Russian A.B.M.’s and M.I.R.V.’s do all they are supposed to as early as they are supposed to, by 1975, Wiesner argued, each side will still have left over—after any surprise attack—far more than enough capacity to inflict unacceptable damage on the enemy. So why build any of the new weapons?

The U.S. seems caught on a nuclear treadmill, Wiesner said, trapped in a myth of anticommunism.

“For the past 20 years, American leaders have opted for a nuclear superiority whose only tangible result has been a continuing arms race in which the price of leadership has been the degradation of our society, the disappearance of our pride in the nation and the total abdication of our traditional role of political and moral leadership in the world.

“America, the land of the free and the home of the brave, has become the land of the fearful, hiding behind a meaningless nuclear overkill.

“We have the chance—once again—to save ourselves, to change directions, to reject the arms race as a way of life and to stop wasting so large a part of our creative energies thinking about the unthinkable and our productive capacities producing the unusable.”

“... Only One Generation ...”

This was language as strong as that of the protesters. And others joined Wiesner in this aggressive approach. Some of the strongest language at the meeting was contained in a speech by President Kingman Brewster of Yale denouncing those impatient people who, he said, appeared to prefer “a dark age of irrationality.”

University communities, Brewster said, “must not acquiesce in the desire of the impatient to escape the moral responsibility for rational choice. . . . Neither table pounding nor dreamy euphoria can be permitted to substitute for plausible argument. . . . A university must give its priority to the numerically small but historically significant band of men and women who believe that the worth and dignity of knowledge does not depend solely upon its current usefulness.”

Brewster said that many of today’s anti-intellectuals seek instant action and simple solutions and abhor doubt. “Dogmatic assertion is a great relief. To some, blind fanaticism is beautiful.”

To be sure, said Brewster, universities are not the only place to seek truth, not all subjects are equally relevant, universities do have social responsibilities, and reason is not the only clue to truth. “We can acknowledge all these things, but we must continue to assert that impetuous action, conscious over-simplification, refusal to doubt and the rejection of reason—all these are the enemies of the university.”

Many people saw signs of such a challenge to reason in the minds of the young people leading demonstrations in A.A.A.S. corridors, buttonholing delegates and interrupting sessions with signs and catcalls.

One of those who felt this way was a young astronomer from Cornell University, Carl Sagan, who said at a press conference that one reason he favored holding a A.A.A.S. session on unidentified flying objects was because of the tide of rejection of science running among the best and ablest students, who seemed preoccupied with the irrational.

Sagan was one of the few scientists at the meeting who mentioned the claims of something besides social utility on Earth. Participating in a panel on space exploration, Sagan noted the fact that the U.S. and Russian space programs draw off large numbers of military officers from weaponeering; then he went on to discuss the emotional impact of being alive at a time when men have first stepped on another planet:

“It is . . . striking that the nations and epochs marked by the greatest flowering of exploration are also marked by great cultural exuberance. In part this must be because of the contact with new things and new ways of life, new modes of thought unknown to a closed culture with its vast energies turned inward on itself. . . .

“In all the history of mankind there will be only one generation which will be first to explore the solar system, one generation for which in childhood the planets are distant and indistinct disks moving through the night sky, and for which in old age, the planets are places, diverse new worlds in the course of exploration.”

Amid the flagellants’ orgy in Boston, Sagan’s words were a relief.



Victor K. McElheny, Science Editor of the Boston Globe, is a regular contributor to Technology Review. Because the A.A.A.S. was in the Globe’s home territory for its 1969 annual meeting, Mr. McElheny became the Chief strategist for a large team of reporters assigned to the event. Technology Review’s own reports of the scientific progress described by A.A.A.S. speakers will appear in the March issue.

"If I had to judge the existence of the moon on the plausibility of the theories, I'd be sure it wasn't there."

The Gestation of Selenology

On July 20 last year, Neil Armstrong and Edwin Aldrin gathered some 45 pounds of assorted rocks and soil from the surface of the moon. Fifty-four days later, after checking that the material did not threaten life on earth and subjecting it to a quick preliminary analysis, the National Aeronautics and Space Administration started to distribute 18 pounds of the moon matter to 142 principal investigators all over the world. And on January 5, 1970, most of those investigators assembled in Houston with over 900 other moon experts to tell each other—and the world—what the moon is really like.

The brief six months leading up to the Lunar Science Conference had been the gestation period for a new laboratory science—selenology. And to judge from the reactions of scientists at Houston, the initial appearance of the infant was, to say the least, confusing. The scientific community's first opportunity to handle pieces from another heavenly body had yielded no synthesis of ideas about the moon, no trend to one particular theory on its origin and growth; indeed, as the conference continued through its four days it was clear that the theoretical position was more complicated than it had been before Apollo 11.

Not only were the proponents of the "classical" theories sticking to them in the light of the new evidence; other scientists, dissatisfied with the views of the old guard, dipped back into the past to resurrect old hypotheses. "After much thought and consideration I've concluded that it's almost certain that the moon is not made of green cheese," stated Gene Simmons, M.I.T. geophysics professor and part-time Chief Scientist at the N.A.S.A. Manned Spacecraft Center in Houston, summarizing the general bemusement of his colleagues.

Not that the conference was a failure—quite the reverse. It had all the drama and excitement of the Apollo flight that had made it possible. Scientists, a large number of them the best scientific minds in the world, buttonholed each other in the corridors to argue technical points and talk about the beauty of the moon-rocks under the microscope, and they eagerly swapped portfolios of micro-

graphs, oblivious of an Apollo 12 rock on display in the foyer behind them. Edward Anders of the University of Chicago noted that "if you bump into a scientist in the hall he's more likely to be a first-rater than at the average scientific meeting."

The methods they had used were equally sophisticated—everything from spectrographs to electron microscopes to nuclear reactors. And some of the handling tools verged on the spectacular—such as single hairs of camel-hair brushes and a diamond knife that can split a hair into 10,000 pieces.

A New Chapter in Solar System History

The results were worthy of their progenitors. There was general agreement that the lunar rocks and soil were exceedingly old, that the moon's chemistry makes it appear a cinder devoid of water and many volatile elements, and that in the material gathered from just 50 square yards of Tranquillity Base scientists have samples from most of the lunar globe.

The age of the moon matter was perhaps the most exciting discovery. Isotopic dating methods put the rocks from the Sea of Tranquillity at 3.6 billion years old, slightly older than the oldest rocks known on earth, and the age of the lunar soil at 4.6 billion years, the figure almost universally accepted as the age of the solar system itself. Thus it appears that man has on the moon a record of the past history of the solar system denied to him on Earth: "We can roll back the curtains on a chapter of the history of the solar system that has been concealed from our view," commented Robert Jastrow, Director of N.A.S.A.'s Goddard Institute for Space Studies in New York City.

The figures on rocks and soil were generally consistent, with the exception of one rock dated by California Institute of Technology's G. J. Wasserburg at 4.4 billion years. This particular rock was assumed to have come from the lunar highlands, which start only 30 miles or so from Tranquillity Base and which are generally regarded as older than the seas (which lap over the bottoms of the highlands like real seas on a shore,

suggesting strongly that they were formed later in time). Further evidence that highland material had finally been brought to earth came with the discovery of anorthosite, a pale, low-density rock very uncommon on earth, in the samples.

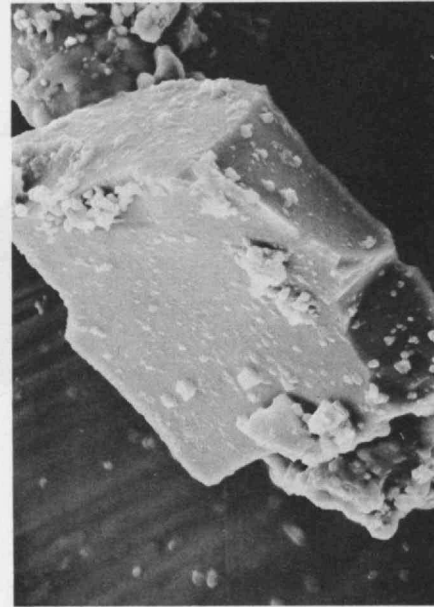
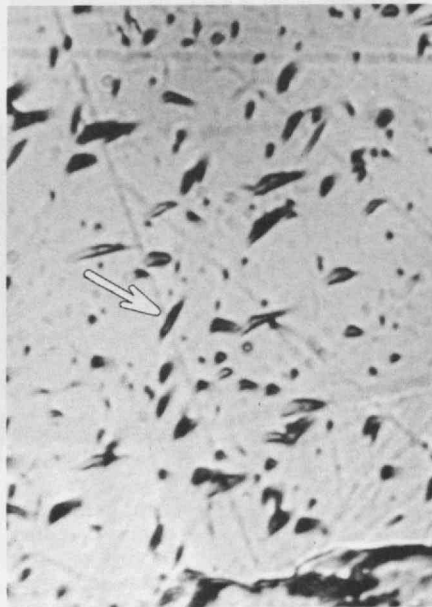
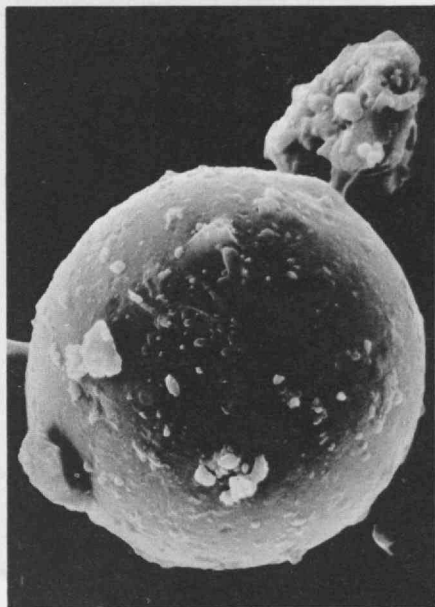
So sure indeed was John Wood of the Smithsonian Astrophysical Observatory that anorthosites were highland material that he suggested that the highlands are made of anorthosite, in a layer about 12 miles thick lying on denser basalt. "We found these little particles and I came to the meeting to assert that we thought that these were pieces of the lunar highlands," he declared. "I expected to have imprecations screamed at me and chairs and slide projectors thrown, and I get here and find that everybody else has found the same thing and come to the same conclusion," he continued, summing up the remarkable agreement on the measurable aspects of the moon that Apollo 11 made possible.

Moon vs. Earth: From Different Cloth

Yet that agreement did not extend to interpretation. The arguments on what the rocks had revealed on the origin of the moon continued even to the final press conference of the meeting. So enthusiastic were the scientists to indulge in instant interpretation, indeed, that they arranged panel sessions each evening to evaluate the day's results. Two typical comments: "Throughout the past two days I've been contrasting what we've learned about the moon with what we know about the earth, and the differences are truly amazing—and to me many of them are unanticipated," said M.I.T.'s Frank Press. "I'm impressed more with the similarities than with the differences," said the University of Massachusetts' Donald U. Wise.

What agreement there was on lunar development concerned the birth of the seas. Some event, it seemed clear, caused at least part of the surface to melt and differentiate about 3.6 billion years ago, forming the rocks on the Sea of Tranquillity. And with the circumstantial evidence of the oldest known earth rocks, it appeared quite possible that a great disturbance, such as a solar flare or a gigantic meteorite bombard-

Three lunar rock samples photographed at the General Electric Research and Development Center, Schenectady, N.Y. On the left is a glassy spherule (magnification about 2300) possibly formed by heat generated during a meteorite impact. The center picture shows the effect of an etching process: cosmic-ray tracks are revealed. The picture on the right (taken with a scanning electron microscope, as is the spherule photograph) shows a lunar fragment at a magnification of about 1300.



ment for example, had overtaken both Earth and moon at that time, destroying all the evidence of the system's first billion years apart from that in the lunar soil—and perhaps destroying at the same time an embryo life on earth.

Yet the picture of the earliest years of the moon appeared just as cloudy as ever. No one was prepared to give ground on his own pet theory (in particular the three old chestnuts: a moon which had spun off from the Pacific Ocean basin, a moon that had started life as a wandering planet that was captured by earth, and a moon formed from the same stew of primordial matter as the earth). And A. E. Ringwood of the Australian National University resurrected a discredited theory that the earth's primordial atmosphere had condensed into tiny orbiting moonlets which finally coalesced into the satellite we know. "If I had to judge the existence of the moon on the plausibility of any of the theories," concluded Wise, "I'd be sure it wasn't there."

Recording Lunar Events

Perhaps a few clues to the origin and present constitution of our neighbor in space will eventually come from seismic studies. To date two seismometer kits

have been mounted on the lunar surface by the two pairs of astronauts who have trodden there, and, according to Gary Latham of Columbia University's Lamont Observatory, they have recorded over 100 lunar events of natural origin—whether meteorite impacts or moonquakes. But so far no means is available for penetrating the lunar globe with seismic waves which will pass clear through its center and indicate the extent of differentiation and whether or not the satellite has a core—both vital pieces of knowledge in building up a composite picture of its structure.

In the absence of such data the mystery of the moon remains. "There is a large amount of undigested data and very little interpretation," concluded Gene Simmons. "You'll see in the next six months many revisions of statements as to what it all means."



Peter Gwynne came to the U.S. in 1966 from the British journal *Discovery* to be Managing Editor of *Technology Review*. He has since served for more than a year as Science Editor of the *Boston Herald-Traveler* and is now Associate Editor of *Newsweek*.

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Having to Construct Something...

Complexities of Urban Models

Urban Dynamics

Jay W. Forrester
Cambridge, The M.I.T. Press, 1969,
285 pp., \$12.50

Reviewed by
Aaron Fleisher
Professor of Urban and Regional Studies,
M.I.T.

Urban Dynamics reports the results of some experiments on the interactions of three components of a city. Each experiment explores the consequences of a particular set of interactions, and therefore completes a particular hypothetical proposition; "If such and such would prevail, then . . .".

If the consequences disclosed are, moreover, intended to be construed as reality, then that "such and such prevails" requires justification. The book neither records nor cites one datum in support of the interaction attributed to the components. Purveying no such evidence, it can lay no claim to history, past or future. This pretense, completely abjured on page 2, is completely indulged by page 116. As an appraisal of policy *Urban Dynamics* is, in its present state, entirely groundless.

It is nonetheless a valuable work. Facilities by which to compose hypotheses and trace their consequences comprise resources essential to the social sciences, for the lack of which their laboratories are scanty enterprises. *Urban Dynamics* draws on such a facility. It is a language whose basic vocabulary is made of two kinds of words, the components of a system and their rates of change. The value (or level) of a component are computed as a simple integral of its rate of change. A rate of change can be expressed as a function of the values of any other components, but not of their derivatives. It is therefore the statements describing the rates of change that bear the sense and structure of the system. All variables are, ultimately, functions only of time but they need not enter into any one expression contemporaneously. In this language, a system is equivalent to a set of simultaneous, first order, ordinary,

deterministic difference equations. They are not obliged to be linear.

The language is facile, and quite rich. It is not as general as is argued. Systems distributed in space—those, for example, whose parameters change with location, or whose variability generates forces—cannot be described in this language because a rate of change cannot be made a function of a gradient, if gradients could be expressed at all. This disability is especially felt when the matter under study is urban because cities, particularly, are distributed systems, a condition in which some of their weightiest problems originate. *Urban Dynamics* reduces a city to a point source and sink. One might be able to imitate geometry by introducing special links between parallel systems. Treating space without being able to mention location is at best awkward. It is likely also to be meager. The language is nicely suited for systems that resemble passive lumped-parameter circuits.

Chapter Six comments on the nature of complex systems. Calling them "counter-intuitive" says no more than complex systems are complex. The reminder helps, but hardly enough to justify the fuss.

A complex system is intricately interwoven; equations representing the behavior of one component is a function of, at least, several of the others. Such interconnections are formally equivalent to feedback loops. In engineering design, a feedback loop is always an *a priori* mode of control. But in social systems, they mark a mode of response. The difference is important. Only in design can a feedback loop be used for policy manipulation. We mean our institutions, more often, to work well without such interventions. The availability of the right to appeal does not diminish the concern for the design of proper procedures in courts of law, and the welfare system grinds inexorably despite its obvious inequities. In both cases, the reach of control by feedback is rudimentary.

Chapter Six argues that complex systems respond sluggishly to changes in their parameters (contending, curiously, that this results because they are "counterintuitive"). The systems of *Urban Dy-*



Urban Dynamics, a pioneering model of urban systems analysis, arrived at policy conclusions on city housing. But here reviewer Aaron Fleisher says, "as an appraisal of policy, Urban Dynamics is, in its present state, entirely groundless." (Photo: Richard M. Koolish).

namics are composed of extensive networks of loops, each operating under transfer coefficients of the same order of magnitude. I suggest this conjecture: there exists a number *N*, the lower bound to the total of the feedback loops of a system, such that, whatever their structure, all systems whose feedback numbers exceed *N* will respond to internal changes in the same sluggish way, provided only that the transferences of the *N* loops are approximately equal, and that no other loop is very much greater.

It would not do to object that reality is interwoven and sluggish, for in the second place, that begs the question. And in the first, a good model does not attempt to replicate all of reality. If it did it would be as muddy. A good model is transparent and just fat enough to do the

job. It is not necessarily better because it enlists more equations.

Professor Forrester has written an admirable book. He has shown how a complex urban system can be formulated and its history traced. These accomplishments are without precedent. There will be a lot of scurrying to catch up.

Technology Review published Professor Forrester's first paper on urban systems in May, 1969, under the title, "A Deeper Knowledge of Social Systems."—Ed.

The History of a Difficult Idea

The Periodic System of Chemical Elements

J. W. van Spronsen
New York, American Elsevier Publishing Co., 1969, 368 pp., \$18.00

Reviewed by
Leonard K. Nash
Professor of Chemistry
Harvard University

Expressing a concept quite foreign to chemistry in mid-nineteenth century, the periodic classification of the elements was first achieved only with the greatest difficulty. This achievement was impeded rather than forwarded by the earlier classification endeavors (beginning with Döbereiner) which singled out particular triads or longer series of elements with simply related atomic weights.

One is struck by the extent to which some participants in this development were animated by purely numerological concerns: Hinrichs, for example, seems in inspiration (though not in capacity) a truly Keplerian seeker after Platonic harmonies. The volume of sheer rubbish acceptable to some editors of some journals is scarcely less striking than the difficulty encountered by Newlands—one of the six researchers who, in van Spronsen's view, independently discovered the periodic system—in securing publication of his work.

In sharp contrast to the multitudes of unimaginative empiricists and overimaginative speculators, the disciplined boldness of Mendeleev makes him a surprisingly dominant figure even within the author's group of six independent discoverers. Yet even after Mendeleev's decisive breakthrough, completion of the periodic system still required enormous labor—seen perhaps most vividly in the excellent chapter on the lanthanides.

Part I of van Spronsen's historical monograph offers an extended discussion of the concepts underlying the first approach to the periodic system and a detailed chronological examination of the work of precursors, discoverers, and developers of that system. The ten additional chapters that constitute Part II treat particular aspects of the system—such as predictions of unknown elements, anomalies of order (for example, tellurium and iodine), and the major problems encountered in properly fitting in the noble

gases, the lanthanides, and the actinides.

In the terminal chapter the author reviews the priority disputes and restates his conviction that the periodic system should be regarded as the achievement of six independent discoverers: in chronological order, de Chancourtois (in France), Newlands and Odling (in England), Hinrichs (a Dane who at that time bore the heroic burdens of professor of natural philosophy, chemistry, and modern languages at the University of Iowa), Meyer (in Germany), and Mendeleev (in Russia). Over one hundred figures display various forms of the periodic table, and all but the first two chapters contain exhaustive citations of the relevant primary literature which, in certain chapters of Part II, carry the story on into the 1940's.

This book is competently researched, well organized, clearly written, attractively produced, and occasionally quite dull. The author's explicit concern to mention all the minor figures has prevented him from telling us anything much about even the few major figures. And because he offers so little insight into the full intellectual history of the development, the author can marshal his data only against the standard set by our present understanding of the periodic system—which means a lamentably systematic backwards reading of history. Most evident in the first two chapters, this failing reflects a general shallowness of penetration perhaps unavoidable in a work aimed at encyclopaedic coverage. And undoubtedly van Spronsen's book will offer an apt point of departure for a further work of scholarship still much in need: an insightful analysis in depth of the pivotal episodes in the difficult and extremely complex development that culminated in the periodic system we today take entirely for granted.

Military Policy and the Congress

American Militarism 1970

Edited by Erwin Knoll and Judith N. McFadden with an epilogue by Sen. J. William Fulbright
New York, Viking Press, 1969, 150 pp., \$4.95.

Reviewed by
William G. Denhard
Associate Director, Instrumentation Laboratory, M.I.T.

American Militarism 1970 is the report of the Congressional Conference on the Military Budget and National Priorities, held in the spring of 1967. It contains the statements of ideas then current in the minds of many congressmen and many astute political observers and scientists. To say that one completely agrees with their views sounds like obeisance before the mighty, and to say that one takes issue with any of their views sounds presumptuous. Yet the latter I must do in part, as well as underwrite much of what is said in this book.

The principal message of this book is that

Congress must be, and lately has not been, responsible for the aims, goals, and structure of the nation in domestic programs, military posture, and foreign policy. Hence, the percentage of our annual budget devoted to military purposes should be under greater congressional control. Further, Congress should weigh the relationship between the two portions of the budget—military and non-military. The emphasis is on reducing the percentage given to military purposes and assigning released funds to restructuring our society for the needs of all citizens.

Some of the most telling statements are in Senator Fulbright's epilogue:

"The ultimate test of any foreign policy is not its short-term tactical success, but its effectiveness in defending the basic values of the national society . . . the preservation of constitutional government in a free society. My apprehension is that we are subverting that goal by the very means chosen to defend it.

". . . We cannot—and dare not—divest ourselves of power, but we have a choice as to how we will use it. We can try to ride out the current convulsion in our society and adapt ourselves to a new role as the world's nuclear vigilante. Or we can try to adapt our power to our traditional values, never allowing it to become more than a means toward domestic societal ends, while seeking every opportunity to discipline it within an international community." This is the struggle behind this book, and it lies at or just beneath the surface throughout.

Unfortunately, this book is not a discussion of the problems and possible solutions. It starts and finishes with the unquestioned assumption that the problem is caused by, sustained by, and precluded from solution by the military component in our society and the use of a large percentage of the national budget for military purposes. Vietnam is described as the mistake of the military. Some contributors are wise enough to recognize the excessive influence of the executive branch and the lack of influence of the legislative branch. But it is fair to ask, If the military had known the operating rules for Vietnam to be imposed by the executive branch, what would have been their reaction to getting involved there? This question wasn't posed, thus leaving the inference that the military wanted a war for war's sake.

But the participants acknowledge that security lies in preventing war. The line to be drawn is, How much military strength will prevent war? The participants believe that the answer to this question belongs to Congress and thereby to the people, and so they say time and again. But with multiple independently targeted reentry vehicles (M.I.R.V.) and the anti-ballistic missile system (A.B.M.) on the horizon, the time for consideration appears short. A.B.M. and M.I.R.V. raise the critical question of capability (technology) versus implemen-

tation, which is not even discussed. The assumption (perhaps based on the congressional tendency to give rubber-stamp approval to past military budgets) is that the military will implement every idea they have. Therefore Congress must consider turning off ideas as well as implementation. That this conclusion provides a very poor base for present and future disarmament negotiations is not brought out.

Also seemingly ignored was the fact that nearly all our social problems—poverty, race, lack of education and opportunity—existed well before the technological explosion following World War II and before anyone knew where Vietnam was. Certainly these problems are not to be blamed on the military or on science and engineering.

These people have defined a problem; but their arguments tend to overlook the simple fact of life that someday, someone, somewhere will have to probe behind the existence of a "too large military budget" in the U.S. and go after the reason. The reason will turn out to be mutual mistrust, and the mistrust will be found to exist not only among nations, but among races, youth, the establishment, our government and all its branches, and the people.

In effect, the participants have volunteered Congress to assume responsibility for this problem of mutual trust; but they will find that even Congress will not be above scrutiny. Their decisions must be above any question of local or personal interests. He who screams "Cut the military budget" must not also scream "But not in my electoral district!"

If the world, and particularly the leaders of other nations of the world, were fully credible and interested only in the betterment of man in general, the questions posed by the Conference would be readily answered, because then our moral principles could very easily be made consonant with military posture. Notwithstanding the real-world difficulties, the questions raised must be answered; Congress must set national priorities and must be responsible for them. Congress must see that mutual trust exists between all nations. Let us hope Congress does a good and creditable job, for it will be playing the same game with the same stakes as they feel the military is now doing. And the stakes are us.

Foray into an Ancient Need

Amputation and Prostheses: A Survey in Northwest Europe and North America

G. E. Fulford and M. J. Hall

Bristol, John Wright and Sons, Ltd., 1969
104 pp., £2.1

U.S. distributor Williams and Wilkins Co.,
Baltimore

Reviewed by
Robert W. Mann
Professor of Mechanical Engineering,
M.I.T.

Amputation followed by prosthesis represents but one of the many possible intersections between engineering and medicine and biology in the amalgamation known as biomedical engineering. The field is as old as the human's need to regain function after traumatic loss of an extremity. Celsus, in the first century A.D. in his *De Medicina*, established the principle of amputation through viable tissue—and the fitting of a peg leg to the stump predates history.

Despite this early start and the inevitability of limb loss, over a quarter million Americans not including military casualties suffer major loss of extremities. Studies of this man-machine system have not received the same quality of attention as, for example, space flight, or in the biomedical engineering field, the implantable heart. However, in the late 1940's, the physical presence of great numbers of World War II casualties and the "conversion" of technology after that war led to a flurry of activity. Useful, relatively prosaic improvements in practical hardware resulted, but several very ambitious, complex, hardware-oriented efforts failed dismally due largely to naiveté with respect to control and feedback coupling to and from the human operator. Norbert Wiener's *Cybernetics*, first published in 1948, put this problem in proper context; research conducted during the 1960's is beginning to demonstrate the practical achievement of prostheses which couple the central and peripheral nervous system to the machine prosthesis using electromyographic signals generated in human muscles.

Literature in the amputation and prosthesis field suffers the liabilities implicit in any cross-disciplinary effort. Certain of the surgical aspects are to be found in appropriate medical journals, advanced machine aspects perhaps in engineering publications, neurological control concepts in either or both physiological and engineering papers, current practice in manufacturers' publicity, and clinical procedures elsewhere. Although formal and informal meetings among the members of the fraternity working in the field are relatively effective, published proceedings are uneven and usually difficult to locate; the various progress and project reports have very limited circulation and are effectively unavailable through libraries. Thus the arrival on the scene of *Amputation and Prostheses* represents a giant stride in coalescing a great deal of pertinent information in a concise, readable, thoroughly effective and easily available treatise. The process which gave birth to the publication warrants consideration in its own right as an attractive way of achieving similar consolidation in other interdisciplinary fields.

The British Limbless Ex-Servicemen's Association (B.L.E.S.M.A.), dedicated to the rehabilitation of amputees in Britain, established and funded the B.L.E.S.M.A. Traveling Scholarship. The first of these grants was awarded to George Fulford, a young orthopedic surgeon, and Dr. Michael Hall, who had

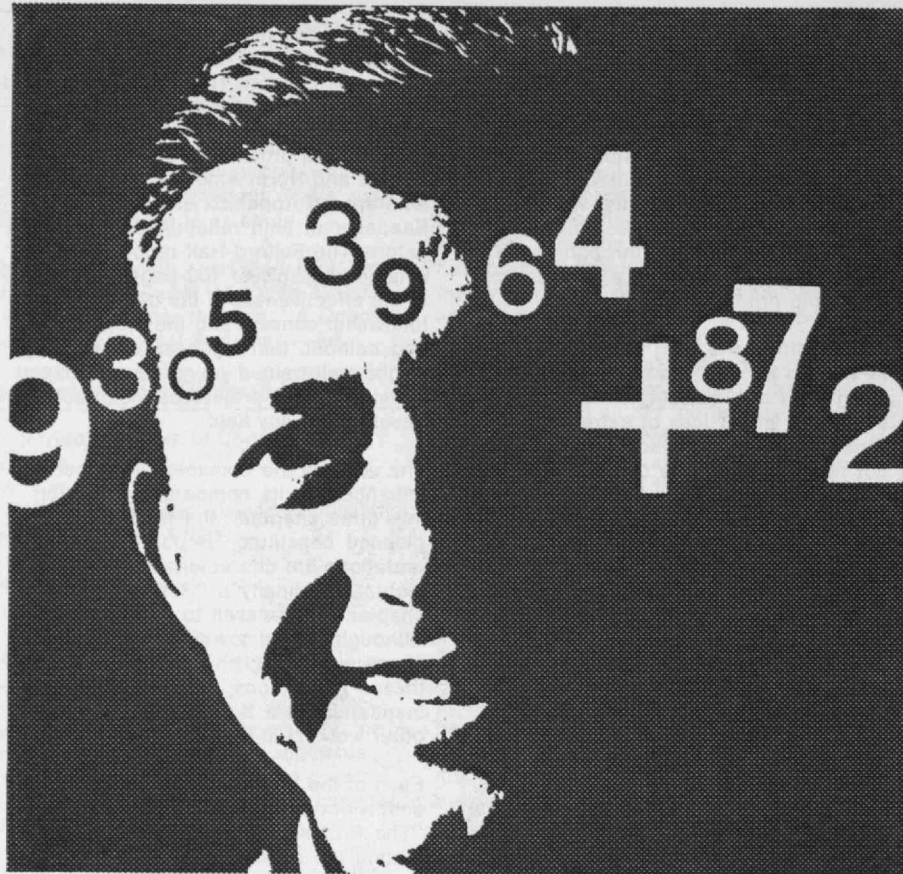
just completed his dissertation on a prosthetics-related topic at Imperial College in London. Their travels extended over a calendar year and took them to virtually every project investigating amputation and prostheses in Western Europe and North America. In fact their itinerary, an Appendix in the book, is a Baedeker of limb rehabilitation investigators. The Fulford-Hall report, a thin volume of just over 100 pages, attests to the effectiveness of the traveling fellowship concept and the incisiveness and catholic thoroughness of two very bright, well-trained young men, unbiased by some of the prejudices inexorably developed in any field.

The utility of the document is further enhanced by its compartmentalization into three chapters: the facts they gleaned constitute "Report," their interpretations are characterized as "Comment," and finally a "Recommendations" chapter is addressed to the B.L.E.S.M.A. Although biased toward the particular needs of the English medical and prostheses professions, certain of the recommendations are broadly applicable to other workers in the field.

Each of the three chapters is in turn subdivided into sections. Discussions in "The Prosthetics Profession" compare, among the countries visited, the organization of sponsoring agencies, the professional training of medical personnel and prosthetists, the availability of statistics on the affected patient population, vehicles for dissemination of information in the field, and the prostheses supply line, including manufacturers, assembly, and clinical fitting. The relative advantages and disadvantages of the centralized approach possible under socialized medicine in some countries of Western Europe are compared to the individualized research team and entrepreneurial, profit-oriented manufacturer common in this country.

The "Upper Limb" and "Lower Limb" sections do an extraordinarily thorough job of reporting the then-current (1965-66) state of amputation procedures, limb engineering developments, and clinical experiences. The deliberate separation of "Comment" from "Report" provides the authors with the opportunity to express opinions based on their keen observations without prejudicing the factual reports on work in progress.

In summary then, *Amputation and Prostheses* represents a unique and thoroughly effective compilation of the state of the art. Beyond this it offers prima facie evidence of the contribution a well-conceived, brilliantly staffed, carefully reported, "traveling fellowship" can produce. The authors and their sponsors are to be congratulated for both the document and the procedure.



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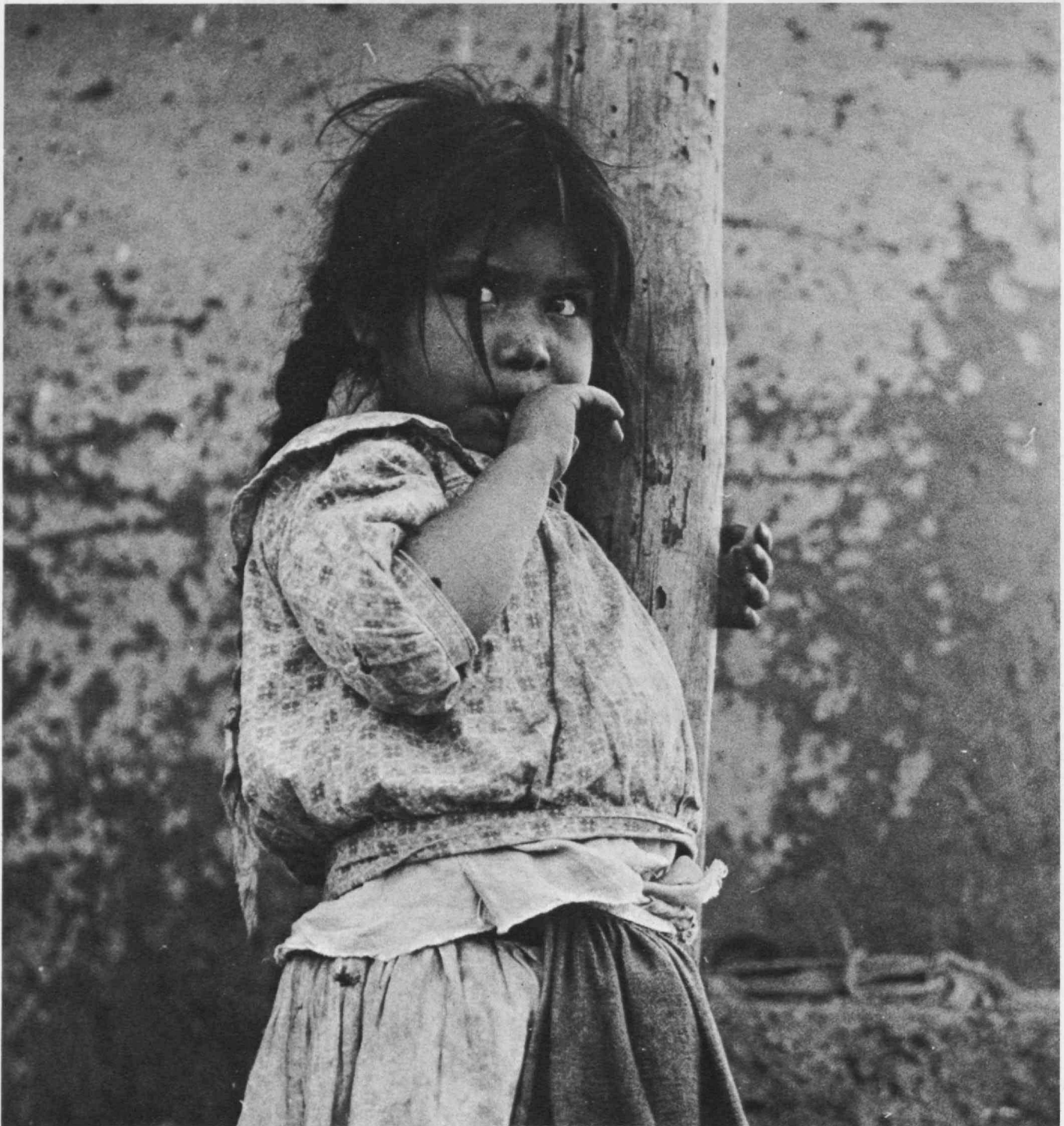
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The protein problem can be ably defined by statistics of economic growth and ratios of food to population, but the faces of those whose lives are interpreted by the figures give us another sort of definition. This is a young girl in Mexico. (Photo: United Nations)



Strengthening existing resources and developing new products are both important routes to improved nutrition. Both must be applied vigorously—and wisely—to solve a growing food problem in underdeveloped lands

Dr. Moisés Béhar, Director
Institute of Nutrition of Central America and Panama

The Protein Problem

The capacity of civilizations to achieve an adequate food supply has been a basic determinant of their stability and progress. In this struggle, the common emphasis is to meet total caloric needs.

The world's tropical and subtropical regions, with limited economic and technical resources, commonly cultivate vegetable foods of high carbohydrate content, such as cereal grains and starch roots and fruits. Thus rice, corn, cassava, and bananas have become the staple foods of the majority of the world's population. The production of protein-rich foods (leguminous seeds and particularly animal products) is much less efficient in terms of calories.

At the present time, protein deficiency constitutes one of the most serious aspects of the nutritional problems affecting most of the world's population. When calories are limited, the protein deficit becomes even greater because at least some dietary protein is used as a source of calories.

This problem may become much more serious in the near future due to the present population growth, which requires a rapid increase in food production, particularly in the less developed countries—precisely the areas where food production is in many instances lagging behind.

It is not necessary to elaborate on the effects of protein-calorie malnutrition on the developing societies and their human resources. In addition to the well-documented effects of increasing morbidity and mortality in small children, evidence is now accumulating on the serious damage of protein-calorie malnutrition on the surviving population through effects on mental development, learning capacity, and behavior. The information presently available indicates that severe malnutrition during the first months of life results in serious and permanent damage of the central nervous system.

A correlation has also been demonstrated between the mild-to-moderate forms of protein-calorie malnutrition, which are much more frequent and usually affect children between six months and five years of age, their retardation in physical growth—which is primarily due to malnutrition—and their performance in some behavioral tests. Although it has not yet been clearly demonstrated whether these behavioral changes are the

direct result of malnutrition or are indirectly due to the social deprivation that usually accompanies it or to a combination of both, there is no question that malnutrition is an important part of the poverty syndrome.

Malnutrition also shares responsibility for serious economic, social, and political problems. The long-term effects of chronic malnutrition on the work capacity of the individual must not be neglected.

Studies now under way at the Institute of Nutrition of Central America and Panama (I.N.C.A.P.) suggest that, although there is some degree of adaptation, the efficiency of physical work performance of agricultural laborers is handicapped by long-standing nutritional deficiencies, though their symptoms are usually subclinical and therefore largely unrecognized. The effects of this situation on the subtle characteristics of these populations, such as motivation and initiative, may prove to be of even greater significance.

We should therefore be seriously concerned over the future. If present problems are not only left uncorrected but are further aggravated as a consequence of an unbalanced population growth, the future of underdeveloped countries and of all humanity will be jeopardized. Under pressure of a rapidly expanding population, particularly where malnutrition prevails, the situation worsens daily. The increasing pressure may first lead to a greater production of calories, and this could further aggravate the protein deficit.

Statistics on food production such as those in the chart on page 26 mask some facts of great practical importance. The figures for food production are averages for a very large and heterogeneous group of countries. Since countries such as Mexico and Argentina have increased food production well above the average, we must conclude that the per capita food production has deteriorated in many other countries. According to estimates made at I.N.C.A.P., this has been the case in Central America, at least for some important foods.

The qualitative nature of the changes is also not apparent in statistics of this type. In this figure, for example, food production includes coffee, sugar, and other items of little nutritional significance but of economic interest as export crops. Producers of such foods receive stimulus and support from the governments,

During the last 20 years both food production and population have been increasing in Latin America at about the same rate, now close to 3 per cent annually. Consequently, the per capita production of food has not significantly changed, on the average. But increases in some countries have been balanced by actual decreases in others, and some of the production figures relate to foods of little nutritional significance. (Data: United Nations Food and Agricultural Organization)

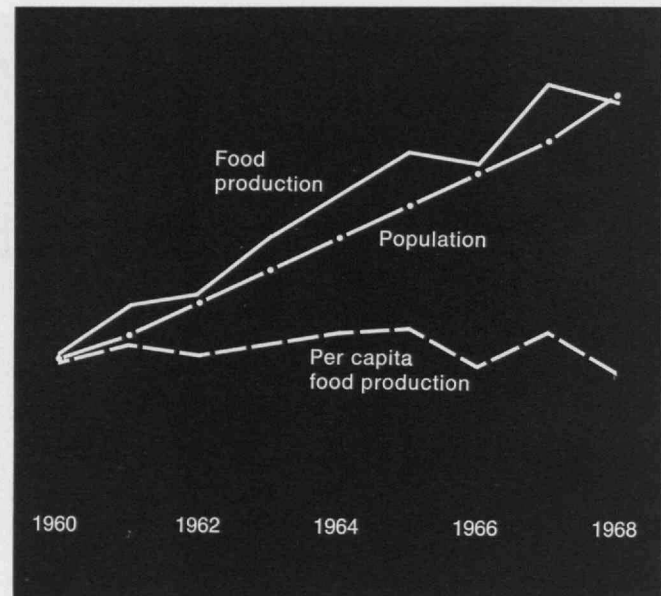
to the detriment of basic food crops. In fact, our data indicate that in Central America production of some of the most important sources of dietary protein such as beans have significantly decreased in recent years.

It is well recognized that available foods are unequally distributed among the different socio-economic groups of a population. This also applies to different family members, a distribution factor that always works against the small child.

Protein as a Critical Constituent

Unlike what happens with most other nutrients, the adequacy of a given diet is based not only on the concentration but also on the nutritional value of the proteins. Concentration and nutritional value must therefore be considered simultaneously. The nutritional value of a protein, or a mixture of proteins, is primarily determined by the essential amino acid patterns. For rapidly growing children, who have not only greater nitrogen requirements in relation to total calories but also proportionally higher requirements of essential amino acids than older children or adults, both protein concentration and nutritional value are particularly critical. Take the case of populations whose main staple is corn. A two-year-old child could satisfy its caloric requirements with 350 g. of corn a day, assuming that he could consume that amount. The child would then be receiving about 35 g. of protein. However, he would not receive the required amounts of essential amino acids, particularly lysine and tryptophane. The protein would have a low biological value for the child and the indicated amount would be insufficient to satisfy his protein requirements. I.N.C.A.P. studies show that with protein intakes of the order indicated (3 g./kg./day), children two to five years old have a very low or negative nitrogen retention when corn proteins are the only sources of nitrogen. This situation is corrected by adding lysine and tryptophane.

By contrast, an adult satisfying his caloric needs with corn will be obtaining 78 g. of protein. In spite of the low essential amino acid concentration, he will still be receiving sufficient quantities of these components to satisfy his needs, including lysine and tryptophane, and he will be obtaining more than sufficient total nitrogen if he satisfies his caloric needs. The problem, of course, is still worse for small children consuming starchy roots or fruits which have even lower concen-



trations of protein than cereal grains.

What is therefore needed in the areas of the world where protein malnutrition now prevails is an increase in the availability and consumption of total dietary sources of protein and—particularly for small children—of sources with a high protein concentration. The problems to be faced in achieving this goal are mainly socio-economic and cultural and, not infrequently, may be political as well. We seem again to be faced with the ever-present lag between scientific achievement and the application of technical knowledge to the realities of the world today. I shall, therefore, discuss some of these realities as we have been attempting to face them during the last 20 years in Central America.

The International Economics of Protein

The conventional, adequate, and more acceptable sources of dietary protein, such as meats, eggs, and milk, are much too expensive for the large majority of the populations in the developing countries. Their internal market cannot compete with the international market where some of these foods are in high demand. As a result, countries with a great deficit of such products frequently export them in large amounts. In rural Guatemala, for example, the average per capita consumption of meats is 40 g./day, but large numbers of the population consume practically no meat at all.

This curve clearly and ominously defines the expected growth of the world's population. The first doubling of the world's population level from the first century A.D. occurred in 1,600 years. The second doubling took just 200 years, and the doubling of current world population should take only 35 years.

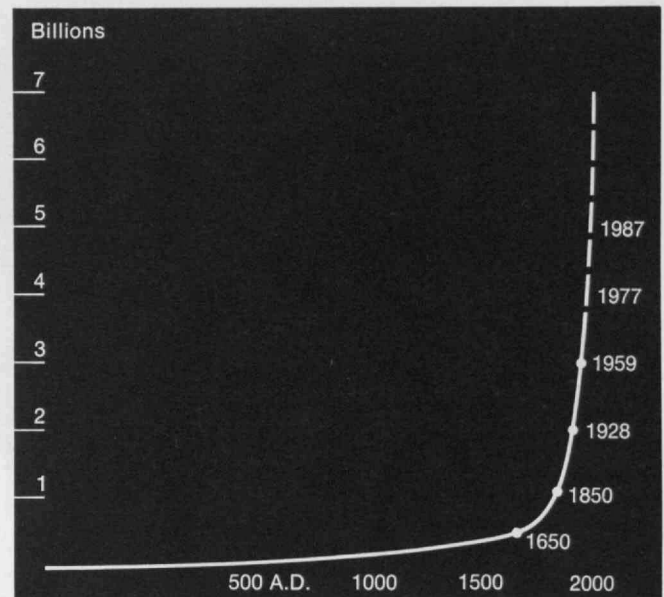
Nevertheless, in 1968, the country exported 10,000 tons of beef.

At first sight this seems illogical. Without the possibility of exportation, however, this meat would not have been produced because the internal market simply cannot afford a "luxury" protein. A recent study carried out as part of a nutritional survey in Guatemala found, for example, that the price of one pound of beef in the local market represented up to 60 per cent of the daily salary of an agricultural worker. This situation is influenced, among other sociological factors, by the low prices brought in the international market by the agricultural products developing countries can export. For large segments of the population, which are practically outside of the cash economy and live primarily on their own production, the situation is considerably worse.

Another serious limitation of these conventional animal products is the common lack of adequate processing and home refrigeration in the developing countries. For example, in Guatemala milk production is generally inefficient. In spite of this there is a natural increase during the rainy season which surpasses the local demand, and farmers have great difficulty in selling their production. The price in the producing areas goes as low as \$.04/per liter. The surplus is sold mainly for cheese production.

During the dry season, there is not enough milk production. Even though the demand for milk is not great, production is insufficient for the entire country on a year-round basis because of inefficiencies in production, conservation, and distribution. Hence, imported powdered milk is used to cover the deficit. In 1968, Guatemala imported over 6 million pounds of powdered milk at a total cost of over 2½ million dollars. A similar amount of skimmed powdered milk was brought into the country for free distribution as part of the United States foreign aid program.

Obviously, if the milk produced in excess of local demand during the rainy season could be locally processed into powdered milk, the economy of the country, the producers, and the consumers would benefit. Locally processed milk, however, cannot compete in price with imported milk even after transportation expenses and import duties are added. This is due to a more efficient production and a much larger volume of



operation in the industrialized exporting countries. Furthermore, and of significant importance, in most cases imported milk is subsidized in different forms by the governments of the exporting countries.

This situation could be counteracted by raising import duties, a measure that the governments are usually reluctant to take because of the political implications of raising the price of a vitally important product. Despite this, such measures have been taken by some of the Central American countries. Costa Rica, for example, has limited the importation of powdered milk, both commercially and for free distribution; as a result, there has developed in Costa Rica the most successful dairy industry of the region. The excess of locally processed powdered milk, particularly skimmed milk, is now purchased by the government for use in supplementary feeding programs, especially for needy pre-school children.

The non-animal sources of protein, perhaps, offer the most immediate possibilities for the improvement of the diets in the underdeveloped countries.

We have been interested for many years in the possibility of lysine and tryptophane enrichment of the corn consumed in Central America, either with synthetic amino acids or otherwise. This would undoubtedly be

Many approaches are being tried to increase the supply of protein in various parts of the world. Raising more livestock—both for milk and for meat—is a solution proposed in Latin America. Silos have been introduced to improve food storage for the dry season; in this photograph Peruvian farmers harvest corn to be used as silage. (Photo: United Nations)



of great nutritional value, for tortillas made from corn flour are the basic food of the populations now suffering protein deficiency. Even if the economic problem could be solved, however, which is not yet easy, we are still faced with the logistics of how to apply such measures. Populations that need supplementation frequently produce their own corn, milling it in the home daily or, more frequently nowadays, in small village mills.

Where and how in this system could the enrichment be done? At home, by every family? In the small mills? Would the people accept an addition to a process to which they have been accustomed for centuries, if they cannot see any immediate advantage? There is no simple answer to any of these questions. We are now studying various possibilities of solving these problems in the hope of finding a way to implement the enrichment for at least some segments of the population.

How to Bring Foreign Aid to Bear

Another question that arises within this context is, how can international organizations and bilateral foreign aid programs be of practical assistance? The easiest and most humanitarian way would seem to be to provide foods which are produced in excess in the developed countries for free distribution to the needy populations. This approach has been extensively used for two decades and is still continuing. Is it a real help?

This international collaboration is, without question, needed in emergency situations. It can also be used, in a restricted manner as a result of careful planning, in

support of suitable local development programs. Frequently, however, the simple donation of foods is not only insufficient but the foods may be inadequately utilized to have any significant impact. Such donations may even interfere with the development and implementation of the measures needed to solve the basic long-range problems.

Too frequently governments have not faced up to their basic nutritional problems because they have been lulled into complacency through the presence of donated food supplies. The restriction which Costa Rica applied to milk supplies from abroad was certainly a major factor in stimulating the development of its dairy industry. The same principle probably applies to the development of other protein sources, including vegetable proteins. In addition, the internal distribution of such donated foods has frequently drained off governmental resources which could have been better utilized in applying more permanent and practical solutions.

What is really needed is to help the countries to develop their own resources, providing them with the technical and other assistance to build up their local human and material capabilities for a better understanding of their problems and for finding and applying the measures to solve them. Only with enough local personnel, capable and equipped with facilities to make better use of present science and technology, will the developing countries find their way out of their present situation.

There is no one solution to the protein problem. An adequate intake of total calories and of all other essential nutrients must first be ensured for an efficient utilization of proteins. The total amount of food available to the population must be taken into consideration.

The several possibilities now being considered to increase the local production of adequate dietary sources of proteins can be classified in the following categories:

1. More efficient production, preservation, and distribution of conventional adequate sources.
2. Improvement of inadequate conventional sources by enrichment procedures, by genetic modifications, or by other changes in their production or processing.
3. Utilization of nonconventional sources now possible with the new scientific and technological developments.

The amount of protein consumed per person per day drops in less developed countries to slightly more than half of the normal intake in North America. Furthermore, a greater proportion of daily protein intake tends to come from sources of lesser quality—notably grains—than are typically used by those living in developed countries. (Chart: "The Quantitative Role of Cereals as Suppliers of Protein," by Quentin M. West, in *Protein-Enriched Cereal Foods for World Needs*, edited by Dr. Max Millner, American Association of Cereal Chemists)

	Protein level (grams)	Per cent of total protein supplied by:						
		Cereals:				Pulses	Animal	Other
		Wheat	Rice	Corn	Total			
Canada	95.6	21.0	0.4	0.9	23.4	2.6	67.2	6.8
Central America and Caribbean	54.2	12.2	7.2	20.8	44.5	13.4	31.4	10.7
Other South America	57.3	19.2	4.4	14.1	40.0	10.3	36.0	13.7
Northern Europe	88.4	24.4	0.6	0.3	29.1	2.4	58.8	9.7
North Africa	68.0	27.2	1.9	7.6	60.4	10.9	25.0	3.7
India	55.6	14.0	22.8	4.0	57.0	25.9	12.9	4.2
Other South Asia	55.0	24.7	33.8	2.0	64.0	11.3	20.0	4.7
Japan	69.9	13.3	29.5	—	47.2	17.3	25.8	9.7

4. Development of new sources.

The problem is so pressing and complex that we should make all possible efforts to implement whatever measures are practical in any given country or region, covering all alternatives. The alternatives are not mutually exclusive; in fact, they are complementary. We face a series of problems for which I believe there are no simple clear-cut solutions. They must be attacked from all possible angles in a coordinated manner. The alternative is an aggravation of human misery with the attendant social, economic, and political implications for the whole world which could invalidate the spectacular achievements of this century. If we are ready to expand our frontiers into space, we must start from a healthier world than the one we have so far been able to develop.

Suggested Readings

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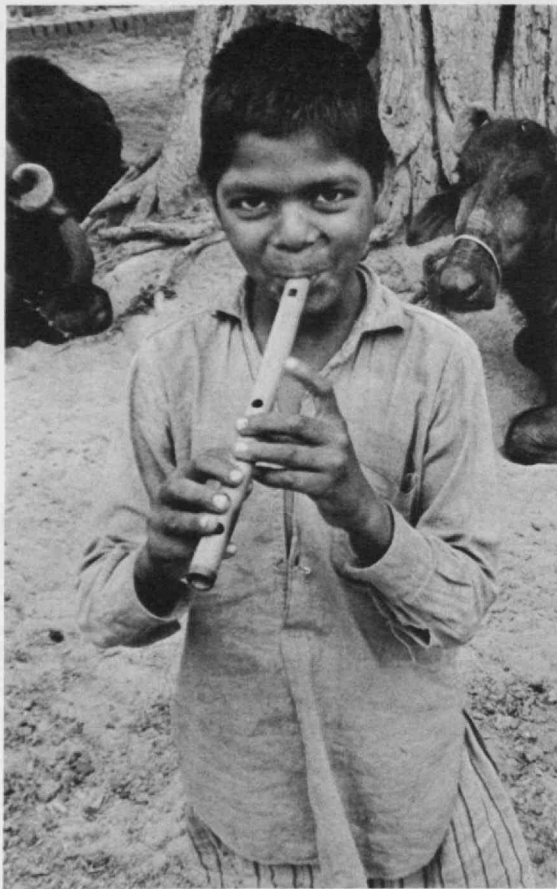
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Their Lives Begin to Change

Those whom malnutrition most endangers live usually in villages or crowded parts of cities ill-served with food, housing, and sanitation. Two of the paths to an improved quality of life, industry and education, exist in simple forms, often only because of stimulation and aid from central governments or international agencies. Yet gains can be seen: these photographs show a composite village with perhaps the beginnings of change.

In the village of Deoli, near New Delhi, a boy plays his flute (upper left).

In the village of Chonabot, in northeast Thailand, a woman unravels cocoons to make silk thread, the local industry (lower left).

A mother and her children can find only gravely inadequate housing in a poor district of Karachi, West Pakistan (below).

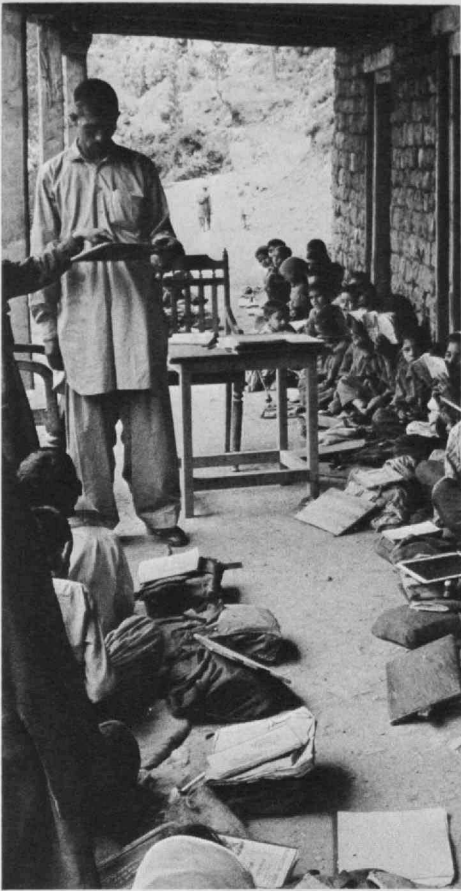
A village school in the Murree Hills region of West Pakistan provides the beginnings of education (near right).

An arid wheat field near Mastung, Baluchistan, provides almost no promise for agriculture unless irrigation can be effected (far right).

A village market in Bahri, India, shows the beginnings of commercial transaction and thereby the beginnings of a higher standard of living (lower right).

(Photos: United Nations)





"One can only take the view that we must do everything we can to make our food supply acceptable and nutritionally adequate at the lowest possible cost. . . . If there is a demonstrated need and it is economically feasible under suitable regulations, I can see no objection to improving the nutritive value of any food that is known to be nutritionally defective."
(United Nations photo: a man and his son in the village of Shivaki, Afghanistan)



Although no conclusive proof can be obtained, the addition of the B vitamins to white bread and flour has effectively eliminated beriberi, pellagra, and ariboflavinosis in the United States. Perhaps protein fortification can similarly affect malnutrition

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Fortification of Foods With Synthetic Nutrients

The protein problem, as well as the continued prevalence in many parts of the world of the vitamin deficiency diseases has once more focused attention on the concept of the fortification of foods with synthetic nutrients for health purposes. This concept of preventing malnutrition is relatively new, since it had to await the development of our knowledge of the details of nutrition, the formulation of recommended dietary allowances, and the technology of producing synthetic nutrients in commercial quantities at a price low enough to make their use feasible. But now fortification can be a significant factor in the effort to provide food for the world's growing population.

Fortification of foods for health purposes began with the addition of a fish oil concentrate to margarine as a source of vitamin A, the addition of iodine to salt as a means of preventing goiter, and the addition of vitamin D to cow's milk. Although these examples do not represent the addition of synthetic nutrients to foods, they laid the foundations for the nutrient improvement of food by fortification.

This concept became so widely accepted that in 1939 the Council on Food and Nutrition of the American Medical Association adopted a policy on the addition of vitamins and minerals to food, and in 1941 the Food and Nutrition Board announced its policy on the addition of synthetic nutrients to foods. A combination of these statements was published again in 1961. It provides that "the principle of the addition of specific nutrients to certain foods is endorsed, with defined limitations, for the purpose of maintaining good nutrition in all segments of the population at all economic levels . . . The requirements are that there should be acceptable evidence that the supplemented food would be physiologically or economically advantageous for a significant segment of the population, that . . . the food item concerned would be an effective vehicle of distribution for the nutrient, and that . . . such addition would not be prejudicial to the achievement of a diet good in other respects." The policy statement designates foods suitable as vehicles for the distribution of the additional nutrients as those whose nutritive content is diminished through refining or processing or those which are widely and regularly consumed. The policy states that the addition of other than normally occurring levels of nutrients to these foods may be favored when the addition appears advantageous to public health and when other methods of

supplying needed nutrients appear less feasible. It indicates that scientific evaluation of the desirability of restoring an essential nutrient to the diet is necessary when changes in nutritional science and food technology make possible the preparation of other nutrient-enriched products which are also likely to make important contributions to good nutrition. The enrichment of white flour and bread provides a good example of how nutrients come to be added to a product. Their fortification with vitamins was first proposed for official recognition in this country in 1940.

The medical and public health professions were deeply concerned about the prevalence of the vitamin deficiency diseases, pellagra, beriberi, ariboflavinosis, and iron deficiency anemia. Yet it was obviously impossible to make any rapid progress toward adequate vitamin and mineral intake through educational methods. It was economically out of the question to distribute the necessary foods to the people who needed them most. It was impractical to persuade large numbers of people who needed them to take vitamin pills regularly. Attempts to increase the acceptability of whole grain products had been going on for years, with little success. The problem, therefore, narrowed down to the question of how to provide the newly available synthetic nutrients (thiamine, riboflavin, and niacin) and minerals (notably iron) to the general population in the simplest and most economical way.

Since the required nutrients were naturally present in wheat, and since the milling process necessary to make white flour and bread, on which the public insisted, reduced the level of these nutrients, the logical way to return the needed nutrients into the diet was to put them back into the flour and so into the one food common to most tables, namely bread. The average consumption of bread at that time was calculated to be about six slices per day. It was easy to determine, on the basis of the recommended allowances of the National Research Council, how much thiamine, riboflavin, and iron should be added to flour and bread so that six slices per day would provide the recommended allowance and protect against deficiency disease.

Enrichment met the requirements of being an excellent public health idea and economically feasible. It was endorsed by the American Medical Association and the Food and Nutrition Board of the National Research

Council, so the next step was to determine how to get the job done. Consultations were held with the people who would be responsible for carrying out the program. The proposal was placed before millers and bakers, members of the medical profession, nutritionists, government officials, and scientists; and it received immediate and wholehearted endorsement. An important factor was the determination that the proposed additives would not change the product in form, appearance, or flavor, and that it was economically feasible without any material increase in the price of the final product.

The U.S. Food and Drug Administration set the legal standards for enriched flour and bread with minimum and maximum levels of nutrients.

The "enrichment" policy was enforced during World War II through War Food Order Number 1, which terminated at the end of the war. Since then, the enactment of state laws in 29 states as well as Puerto Rico, which require that commercial white bread and flour be enriched according to the Food and Drug Administration standards, has ensured its continuation; and beriberi, ariboflavinosis, and pellagra have disappeared as public health problems in this country.

The enrichment program was carried forward without any direct experimental evidence that the enrichment would be successful or effective. It seemed clear enough, since thiamine had been demonstrated to prevent and cure beriberi, that any food to which thiamine was added would help prevent the disease. The same reasoning was applied to the deficiency diseases: pellagra, due to niacin deficiency, and ariboflavinosis. However, questions arose and have continued to arise over the past 25 years as to whether the enrichment program was effective, and people still seem to want direct proof, which is practically impossible to obtain.

I doubt very much that any experiment will ever be successfully designed which will prove conclusively the benefits of the addition of any synthetic nutrient to a food fed to a large population. Other events always take place at the same time—changes in the economic situation, changes in food intake, the occurrence of epidemics that cannot be anticipated or controlled.

Design of a study that can ethically be carried out to prove that a product is effective in a situation of this kind, affecting the general population, is exceedingly difficult. If the study is done on a confined, selected group of individuals, it is immediately criticized on the basis that its conditions do not apply to the general public. If a large-scale study is made of the general public, one is faced with evaluating one of many events occurring at the same time; the effects of enrichment cannot be separated from those of nutrition education, food availability, food prices, income, etc. Even when the U.S. Department of Agriculture shows by its family dietary studies that the vitamins present in enriched bread and flour yield a substantial contribution toward making a deficient diet reach recommended allowances, the argument is made that these data do not apply to individuals. A clear-cut appraisal of a health measure of this kind, designed to be for the public health benefit of

the population of the entire United States, is therefore extremely difficult. In the case of bread enrichment, it seemed unnecessary given the logic of the situation.

Statistics indicate that the enrichment program was beneficial. When the measure was instituted, cases of niacin deficiency were numbered in the hundreds of thousands. There were 1,836 deaths from pellagra in 1941 when enrichment was introduced; niacin had been available as a treatment for pellagra for about five years. In the ten years following the introduction of the enrichment program, the number of deaths dropped to 262, and in 1966 there were only 21 recorded deaths from pellagra in the entire United States. Clinical riboflavin deficiency and beriberi heart disease are now rarities. Studies of chronic alcoholics in Chicago and Boston in 1941 revealed many such cases. Five years later, studies of these same groups failed to find the disease. There was little doubt in the minds of those making the study that the disappearance of the disease in this group was due to the enrichment program.

Of more direct bearing are the studies that were made in Newfoundland in 1944 and in the resurvey in 1948. Four years after the introduction of enrichment, there was good evidence of its beneficial effects. The infant death rate declined by 60 per cent during the first ten years of the enrichment program. Furthermore, beriberi—which once was common—is no longer seen in Newfoundland.

Another study, showing the beneficial effects of adding thiamine to rice, was carried out in the Philippines by Dr. J. Salcedo and his associates in 1947-48. Among a population of 63,000 people on the Bataan Peninsula, there were 167 deaths from beriberi in the year 1947-48. Following the introduction of enriched rice, the deaths from beriberi declined to 49 in the year 1949-50 and none during the fourth quarter of that year. The effects of fortification are more easily seen in a severely deficient population, such as that on Bataan.

In the United States, where there is a wide variation in diet, and where the numbers affected are relatively small, the effects of adding synthetic nutrients to foods are more difficult to follow. Measuring such effects would require special studies of low-income groups where malnutrition is more prevalent. Even then the results would very likely be inconclusive because of the difficulty in controlling the total diet, in preventing other changes from occurring at the same time, and in making the necessary clinical and biochemical evaluations. These effects, of course, cannot be attributed entirely to the enrichment of bread and flour; still they are consistent with the proposition that, by putting vitamins in the foods most widely consumed by the poorest income groups in which deficiencies were shown to be widely prevalent, we are making a positive contribution to health. My conclusion is that the public health value of the addition of synthetic nutrients to food has been amply demonstrated with the vitamins, although it has never been proven. The vitamin deficiency diseases have very largely ceased to exist as public health problems where synthetic nutrients have been added to foods, although no one is able to offer conclusive

Required ingredients per pound		Thiamine	Riboflavin	Niacin	Iron	Calcium	Vitamin D
White flour	Minimum	2.0 mg.	1.2 mg.	16.0 mg.	13.0 mg.	500 mg.	250 U.S.P. Units
	Maximum	2.5 mg.	1.5 mg.	20.0 mg.	16.5 mg.	625 mg.	1,000 U.S.P. Units
Bread	Minimum	1.1 mg.	0.7 mg.	10.0 mg.	8.0 mg.	300 mg.	150 U.S.P. Units
	Maximum	1.8 mg.	1.6 mg.	15.0 mg.	12.5 mg.	800 mg.	750 U.S.P. Units
Corn meal and grits	Minimum	2.0 mg.	1.2 mg.	16.0 mg.	13.0 mg.	500 mg.	250 U.S.P. Units
	Maximum	3.0 mg.	1.8 mg.	24.0 mg.	26.0 mg.	750 mg.	1,000 U.S.P. Units
Farina	Minimum	2.0 mg.	1.2 mg.	16.0 mg.	13.0 mg.	500 mg.	250 U.S.P. Units
	Maximum	2.5 mg.	1.5 mg.	20.0 mg.	—	—	—
Rice	Minimum	2.0 mg.	1.2 mg.	16.0 mg.	13.0 mg.	500 mg.	250 U.S.P. Units
	Maximum	4.0 mg.	2.4 mg.	32.0 mg.	26.0 mg.	1,000 mg.	1,000 U.S.P. Units
Pastina	Minimum	4.0 mg.	1.7 mg.	27.0 mg.	13.0 mg.	500 mg.	250 U.S.P. Units
	Maximum	5.0 mg.	2.2 mg.	34.0 mg.	16.5 mg.	625 mg.	1,000 U.S.P. Units
Macaroni products	Minimum	4.0 mg.	1.7 mg.	27.0 mg.	13.0 mg.	500 mg.	250 U.S.P. Units
	Maximum	5.0 mg.	2.2 mg.	34.0 mg.	16.5 mg.	625 mg.	1,000 U.S.P. Units

Some foods are already fortified in the United States to prevent deficiency diseases. The amounts of nutrients added are care-

fully defined by the Food and Drug Administration, as this chart shows.

proof of the direct effects of the procedures. It has also been demonstrated that the deficiency will produce lesions, in experimental animals, and having demonstrated that the administration of vitamins will cure these lesions, in both animal and man, it seems one might logically assume that increasing the intake of the nutrient will be of benefit to a population deficient in the vitamin concerned.

The question today is whether to add lysine and methionine, and possibly threonine and tryptophane as well, to foods. We already see the same questions, doubts, and uncertainties arising in the minds of scientists which arose in the case of the vitamin fortification 30 years ago. I anticipate many of the same questions we faced before, such as: What level of the amino acid should we add? Will the addition create an imbalance that will be harmful? Will there be toxic effects if too much is added? Should the mixture be adjusted to meet human needs, or what would be an amount that would make a theoretically good protein? Some scientists will ask for experimental proof that the addition is effective before it is done. Others will say that fortification is too expensive and a waste of money, that the same effect could be obtained by education or by making available natural high-quality protein.

Many of these questions do not need an answer, and to some an answer is impossible. It has been amply demonstrated in experimental animals that if the nutrients are complete, except for lysine, the animal will not grow properly until lysine is added. It would appear, given a population on a diet of low protein quality in which lysine is one of the limiting amino acids, that nothing but benefit could be obtained from the addition of this non-toxic material to a commonly eaten, lysine-deficient food.

Indeed, one cannot ethically set up a study which includes withholding lysine from the human food supply when animal experiments indicate that such withholding can only be deleterious. It is also evident that if a diet is deficient in several nutrients, as is the usual case in

human diets, the provision of only one of these such as lysine is going to have little or no effect.

Other amino acids promise to become available, and the chemical industry offers the possibility of nutritionally improving the food supply as the world population continues to expand to the point where the distribution of foods of good nutritional quality becomes uneconomical as compared with synthetic products. One can see the possibility in the future of a way to make synthetic fats and carbohydrates, as well as complete mixtures of amino acids or mixtures of essential amino acids and nonspecific nitrogen, to supply the calories and nutrients we may not be able to supply in any other way.

One can only take the view that we must do everything we can to make our food supply acceptable and nutritionally adequate at the lowest possible cost. To accomplish this, we must use synthetic nutrients of all kinds on the basis of demonstrated safety and effectiveness in experimental animals. If there is a demonstrated need and it is economically feasible under suitable regulations, I can see no objection to improving the nutritive value of any food that is known to be nutritionally defective.

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New foods already being distributed, some of them special products for children, will help to ensure that this Liberian baby—and her mother—will remain healthy. (Photo: United Nations)



Every new source for protein has its frustrations as well as its promise. Research in both laboratory and marketplace is needed to resolve the world's growing protein needs

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The Potentials for Increasing World Protein Supplies

There is not the slightest doubt that three approaches to increasing protein food supplies merit the highest priority. One is the increased production of conventional plant, animal, and fish sources of protein by providing fertilizers, pesticides, improved animal breeds and varieties of seeds, appropriate farm equipment, training and extension programs, credit facilities, and all of the other measures responsible for the success of food production in the industrialized countries. A second imperative need is for massive mobilization of resources and effort to reduce preventable waste, which amounts to well over 25 per cent of the food produced in many developing countries. There are also important ways in which the further application of science and technology can help to supply protein adequate to meet human needs in developing countries.

Despite the relatively low concentration of the protein in most cereals, the quantities consumed are so enormous as to account for more protein than all other sources combined. The quality of protein in most cereal grains is so poor that much of it cannot be utilized. A major means of increasing the value of existing protein supplied by cereal grains would be to improve its quality, either by the addition of limiting essential amino acids in synthetic form or of protein concentrates in which essential amino acid composition complements that of the cereal. For example, only about one-half of the protein in wheat is utilized because the essential amino acid lysine is deficient; corn protein is poorly utilized because both lysine and tryptophane are inadequate. Where wheat is milled into flour on a large commercial scale, lysine can be added at the time of milling. When limiting amino acids are added to plant proteins, their protein quality can be made comparable to the best animal proteins, providing other factors do not interfere. The limiting amino acids can be added in synthetic form, by breeding them in, in protein concentrates, or by a combination of these approaches.

In countries such as India, where most wheat is milled in the village, or even in the home, the grain itself can be enriched. Lysine and other enriching nutrients can be prepared in a carrier which simulates grains of wheat so that the fortified grains can be added to the sacks of wheat which the housewife takes home to grind by hand.

With lysine as low as \$1 per pound, or even less, improvement of protein quality of wheat by this means is

feasible and desirable for some countries. This principle cannot yet be applied to corn-eating areas, however, because of the high cost of tryptophane. For both wheat and corn a preferable alternative may be the addition of a small percentage of dried milk solids, fish protein concentrate, or one of the oilseed meals.

When the required materials are available at low cost in a developing country, an even better approach for the enrichment of cereal flours is to combine the addition of necessary amounts of methionine or lysine with small quantities of legume or oilseed meal. This will not only improve the quality of the protein in the flour, but also will provide some additional protein. The nutritional result is similar to that when nonfat dry milk solids or fish protein concentrate are added to cereal flour in appropriate quantities. Cottonseed flour and cereal mixtures such as Incaparina are improved by lysine; soya and cereal mixtures such as Fortifex, by methionine.

A very promising way of improving the protein quality of maize by genetic manipulation has recently been described. The incorporation into the kernel of either of two genes, Opaque-2 or Floury-2, results in a higher lysine and tryptophane content without appreciably interfering with the agronomic characteristics of the variety into which it is introduced. The result for nonruminants and man is a doubling of the net utilization of the protein in corn. New varieties of maize have also been developed with much higher protein content into which a gene for improved protein quality can also be introduced.

Efforts should now be directed to finding ways to bring about similar genetic improvement in sorghum, millet, and wheat and to increase the quantity of protein in rice, which already has protein of relatively high quality. These modifications will, of course, affect the way in which these cereals are used in processed foods.

Another recent development of great potential significance to world protein supplies is the discovery in both Egypt and the United States of gossypol-free varieties of cottonseed. When ordinary cottonseed is processed, the black pigment, gossypol, binds the epsilon amino group of lysine, thus lowering protein quality; but if too much unbound gossypol remains, there is a danger of toxicity. This has greatly complicated the processing of cottonseed to yield a flour suitable for human consumption.

The cost of protein can be significantly lower in foods fortified with amino acids or protein concentrates than in the foods we commonly use as protein sources, as is shown in these two charts. (Data: Protein-Enriched Cereal Foods for World Needs, edited by Dr. Max Milner)

Distribution of gossypol-free cottonseed should receive high priority, and other applications of genetics to improving the quantity and quality of protein in conventional plant sources should be sought.

As indicated earlier, it would be irrational to concentrate only on producing more protein while ignoring the sizeable preventable loss of protein to insects, mold, rodents, birds, and even, in some countries, to monkeys. The losses which occur in field crops during growth and just before harvesting could be reduced by the overall improvement of agricultural practices, including the increased use of pesticides. The losses which take place during storage and distribution, particularly in developing countries, are often even more extensive and can be greatly reduced by introducing more modern methods of processing, storage, packaging, and distribution.

Unconventional Food Sources

In addition to measures such as these to increase the usefulness of conventional protein, it will be essential to supplement conventional sources with unconventional ones.

Oilseed Meals

Approximately 8 million metric tons of fermented or cooked soybean products are consumed annually in the Far East and another 3 million metric tons of peanuts, coconuts, and other oilseeds are eaten in various parts of the world. Almost no use is being made for human feeding of the remaining nearly 70 million metric tons of oilseeds. The meal left after soy, peanut, cotton, sesame, sunflower, and other oilseeds have been processed to extract their oil contains 40 to 50 per cent good-quality protein suited to human consumption and is particularly useful in combination with cereal grains. Because the extracted oil (and in the case of cottonseed, the fiber as well) pays part of the cost, these meals are the world's cheapest sources of protein and are likely to remain so. They provide protein at a cost of U.S. \$.08 to \$.12 per pound compared with U.S. \$.61 to \$.71 for nonfat dry milk at the current world market price, and U.S. \$1 to \$2 for most other protein of animal origin. Although available in large quantities in most developing areas, this nutritious and low-cost protein-rich material is now largely exported, fed to ruminants, or wasted as inefficient fertilizer.

Most of the developing countries have enough oilseed

	Price of product (cents per pound)	Per cent protein	Price of protein (cents per pound)
Chick-peas	5	20	6
Wheat flour	5	11	11
Beans	9	22	24
Skim milk powder	15	36	31
Fish, dried	35	37	89
Cheese	32	25	111
Chicken	26	19	123
Beef	27	15	164
Pork	24	10	197
Eggs	24	11	204
Lamb	30	12	228

meal, if properly processed, to meet the present protein needs of children. Existing technology is adequate to produce oilseed meals suitable for simple low-cost protein-rich food mixtures such as Incaparina, Pro-Nutro, Fortifex, Multi-Purpose Food (MPF), and the excellent formula developed at the American University in Beirut, Laubina. Infant foods containing processed full-fat soya have been successfully tested in China (Taiwan). While additional processing research, particularly on cottonseed, is needed, the main obstacle to the general use of products containing oilseed protein is the lack of market research to determine the best form and manner of presentation of the product and the need for the kind of promotional effort essential to effective marketing.

From the standpoint of available quantity and cost, oilseed meals are by far the most important sources of protein to develop for human use at the present time. It is particularly important, however, to recognize that the most promising and palatable new protein-rich foods will remain laboratory curiosities unless they are successfully produced and marketed, whether the protein is from fish protein concentrate, single cells, or oilseed meals. The difficulties and delay in introducing both Incaparina and Laubina are examples which well illustrate this point.

The feasibility of extracting protein from oilseed meals in relatively pure form for protein isolates has been demonstrated in a number of countries. In India, peanut

	Price of product (cents per pound)	Per cent protein	Cost of protein (cents per pound)
Multi-purpose food (India)	18	42	36
Arlac	21	42	40
Incaparina (Guatemala)	19	28	47
ProNutro	15	22	47
Cottonseed flour	7	55	5
Toasted soy protein	8	50	11
Lysine	—	—	7
Fish protein concentrate	27	85	25
Protein isolate, Promine D	35	97	32
Lypro	35	65	48
Leaf protein	47/37	50	83/63

protein isolate is being successfully used for the toning of buffalo milk. This milk, which has twice the fat content of ordinary cow's milk, can be made to go much further if additional protein and water are added. This is desirable not only because it can double the protein available in milk form, but also because milk of lower fat content is more suitable for the young infant.

A number of companies have produced experimental foods from spun soy protein isolate which acceptably simulate the texture, appearance, and flavor of hamburger, bacon, ham, scallops, fish, and chicken. Simulated bacon chips of this material have been incorporated into one commercial brand of peanut butter and are also being sold in food stores in the United States. In industrialized countries such products seem likely to add to the use of oilseed protein, although the minimum essential processing steps are sufficiently complicated that they preclude really low-cost protein in this form at the present time.

More recently, a cheaper and less sophisticated "protein bits" type of product has been proposed. A suitably treated oilseed meal mixed with water and flavoring is extruded at high temperature and pressure through a nozzle into a zone of lower pressure. Water is flashed off at low pressure and a dry, foamy mass results which, on rehydration, has a gel-like structure with a texture resembling meat pieces. Since the raw material is cheap and the type of extrusion equipment is relatively simple, the development of products of this type may have im-

portant application in developing countries.

Fish Protein Concentrate (FPC)

Fish protein concentrate is a stable form of protein which can be fed even to infants, and it can be made from fish available in very large quantities because they are lower in the food chain of the sea and not considered palatable as fresh fish. Popular ocean fish such as halibut, tuna, and salmon are not available on a sustained yield basis in the quantities required for production of fish protein concentrate. Moreover, they would be too expensive for this purpose. FPC is far cheaper because it can be made from abundant fish which would otherwise not have a ready market except as animal feeds or fertilizer.

The feeding of fish protein in quantity to infants and young children requires that suitable fresh fish be processed into a fish protein concentrate by extracting most of the fat and oil. With or without solvent treatment to remove flavor and odor, the resulting concentrate contains about 80 per cent protein. Several processes are now known for making an FPC which is wholesome and safe for human consumption, highly nutritious, blends well as an additive in many types of commonly used foods, and which can be produced at a protein cost considerably below that for dried skim milk. Even calculated per pound of protein, the cost of deodorized FPC, U.S. \$.20 to \$.30, will be considerably higher than that of oilseed protein but less than that of nonfat dry milk. While a product retaining a fish odor and taste can be produced more cheaply, its marketing is usually more difficult. And, few developing countries have ocean-going fishing fleets or a fishing industry to support the production of FPC on a commercially practical scale.

The obstacles to major contribution by FPC to the protein needs of the infants and young children in developing countries are (a) the need for modern fishing industries to provide raw material, (b) the construction and operation of plants to make acceptable FPC at low cost, (c) the finding of acceptable ways of using the products in foods, and (d) the marketing and promotion of the product.

It has been suggested that countries with large fishmeal production do not need fish protein concentrate for human consumption because the cheaper feed-grade meal can be used in poultry rations. For impoverished people

this is unrealistic, since even at an improbably low U.S. \$.15 per pound for chickens and \$.20 per dozen for eggs, protein from poultry and eggs would cost U.S. \$1.20 per pound. Developing countries with adequate access to fisheries resources should take full advantage of the potential contribution of fish protein concentrate to food supplies, particularly for young children.

Single-Cell Protein (SCP)

No major differences exist between protein derived from the single cells of yeast or bacteria and the protein of other plants and animals. Sufficient information has accumulated to indicate that single-cell proteins are readily utilized by animals and man. The advantages of microorganisms as sources of protein are their rapid growth and ability to convert cheap energy sources and nitrogen into high-quality protein. These microorganisms can obtain energy from petroleum fractions, natural gas, or starchy vegetables and vegetable residues.

There is as yet, however, no final assurance of an acceptable product for human consumption except for food yeast, which has been used in small quantities in processed foods for more than 50 years.

During both world wars the production and use of food yeast in Europe increased temporarily. But even if the cost of yeast production could in some way be brought lower, research and added processing would be needed to eliminate the yeasty taste and increased intestinal gas complained about when yeast is fed in substantial amounts to human subjects.

Protein from single-cell organisms has the special merit that it is produced without the need for agricultural land or the products of agriculture. Assuming a 50 per cent efficiency of conversion, the petroleum products required to produce single-cell protein for a million people per year would amount to a negligible one ten-thousandth of current crude oil production. Alternatively 2 million cubic feet of methane, available in enormous quantities in natural gas, are calculated to suffice for producing 10 tons of such protein. In either case, nitrogen is not a limiting factor to quantity or cost because the organisms can use ammonia fixed from the air or obtained from mineral nitrate. Some developing countries could utilize further one of the few concentrations of modern industrial technology available within their borders by producing single-cell protein in association

with existing petroleum refineries.

The use of vegetable starch as the energy substrate for producing single-cell protein should also be investigated, since starch is often cheaper to produce than purified petroleum fractions. Starchy root crops can supply edible protein by this means.

There is a broad range of microorganisms which might prove suitable for continuous culture production of protein and a wide variety of possible natural and synthetic substrates. In this early stage of development, work on single-cell protein should not be limited to the organisms or substrates selected only by industrial groups. The best way to avoid too narrow an approach and to bring relevant basic scientific information to public notice as a stimulus and guide to further work is to assure support for single-cell protein research in a number of academic institutions and government laboratories.

Studies are required of the growth, separation, processing, flavor, nutritive value, and toxicity to animals of various types of SCP; and human testing of promising products is essential.

The effects of the high nucleic acid content of yeast and bacterial cells would also need investigation. Debittered brewer's yeast is subject to these same limitations. Because they are more costly as a protein source than oilseeds, yeasts, like other forms of single-cell protein, are not likely to be used extensively in the current decade. If the quantities of oilseed meal become inadequate for future needs, as has already occurred with nonfat dry milk, single-cell protein should become increasingly competitive in cost and useful as a source of protein for human consumption.

Priorities and Alternatives

Low cost and immediate availability give oilseed proteins first priority in the development of new, unconventional sources of edible protein to meet world needs. Fish protein concentrates merit second choice, since they are closer to achieving large-scale industrial production than single-cell protein and have been approved for human use. Single-cell protein deserves at least third priority. Despite formidable technical problems remaining, there is little doubt that wholesome and nutritious single-cell products can be developed and produced in almost unlimited quantities within a decade.

Even when production problems are solved, however, these single-cell products may encounter the same resistance to incorporation at high levels in human diets observed when food yeasts were introduced. Marketing in acceptable form and successful promotion will present the same problems anticipated for the introduction of oilseed meals and fish protein concentrate.

I have not mentioned that green leaves, seaweed, and other algae contain protein of relatively good quality in their cells and can be obtained in almost unlimited quantities. The protein can be precipitated from the expressed juice of green leaves. In the case of one-celled algae, an unsolved problem is the satisfactory rupture of the cell. However, crude protein from either algae or green leaves has a somewhat unpleasant taste. Furthermore, limited pilot plant experience suggests that production costs would be higher than for single-cell protein or fish protein concentrate, even without further processing to improve palatability. Nevertheless, the efficiency of photosynthesis for conversion of nitrogen to protein is high and the possibility of a technical breakthrough should not be underestimated.

Synthetic Foods

All essential amino acids are available in chemically pure form—although, for some, production costs are still extremely high. It should be technically feasible to combine these into palatable synthetic foods, fully satisfying the protein requirements of man, but the present cost would be prohibitive. As synthetic amino acids are used increasingly in fortification of natural foods and synthetic processes are developed further, however, the cost will decrease.

Vitamins and minerals essential to man are already available in chemically pure form at a low cost. There is also good reason to believe that energy can be supplied in human diets through wholly new compounds cheaply synthesized for the purpose. The simple hydrocarbon, 1-3 butanediol, available at a cost of U.S. \$.14 per pound in carload lots, has been proven to be a suitable energy source for animal feeding with a caloric density of six cal./g., a value midway between that of natural carbohydrates and fats. Since the compound is metabolized through carbohydrate pathways, it is usable interchangeably with carbohydrate as an energy source. A slightly bitter taste renders it unsuitable for use in human diets, although hope exists that more palatable

derivatives can be prepared, or similar compounds synthesized, which do not have this disadvantage. The development of practical synthetic sources of energy for human diets is another area warranting research support.

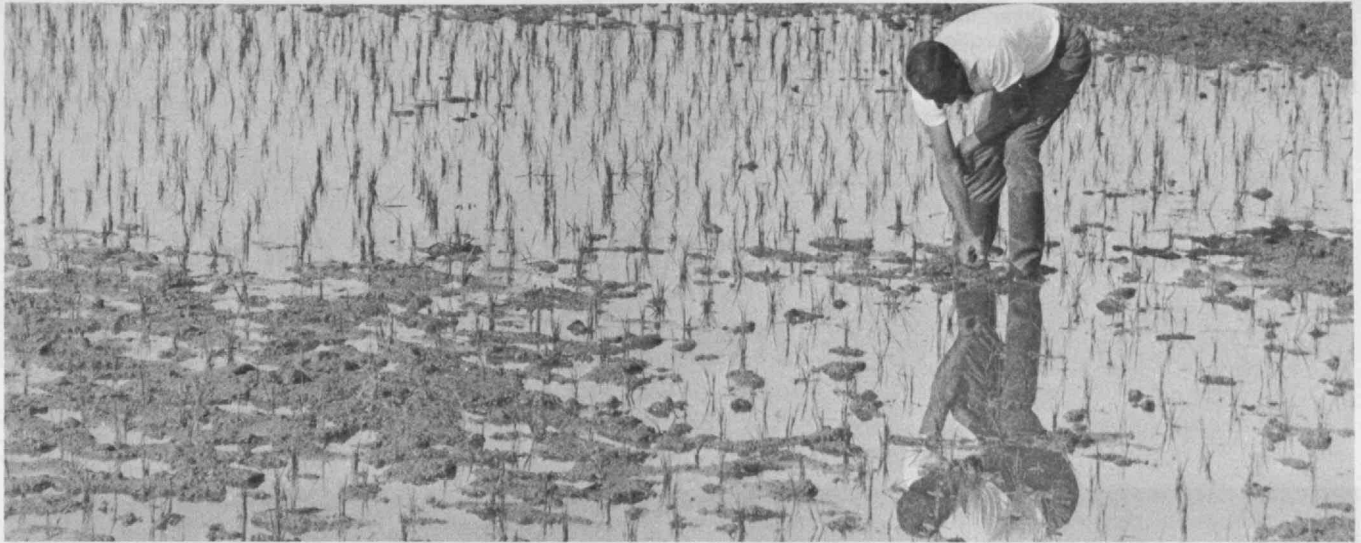
Even at a conservative estimate, synthetic foods which meet protein requirements by supplying the proper proportions of essential amino acids are likely to become significant before the end of the century. They are almost certain to be more costly to produce for a long time to come than the other new protein sources described. Thus, a crash program for the development of synthetic protein-rich foods is not recommended. However, fundamental research leading toward wholly synthetic foods should be modestly supported for its eventual contribution to meeting protein requirements. Many natural materials such as rubber, dyes, and textile fibers, which were once major agricultural crops, are now produced synthetically in far greater volume than would be feasible if they required agricultural land. This will some day be true of much food as well.

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We may stay ahead—for a decade or so





The practice of agriculture has improved—the green revolution—as governmental and international agencies provide farmers with new techniques and new types of grain.

A great problem for many parts of the world, however, is still insufficient water—a proposed dam on the Mekong River in Laos (far upper left) would provide both water and electric power to Laos and Thailand. (Photo: United Nations)

Irrigation proceeds under more primitive conditions in India (near upper left). Farmers use the traditional system of lever and counterbalance to raise water to irrigation channels near Tanjore. (Photo: United Nations)

A new strain of corn (far lower left) dramatically shows its virtues compared to a field of a common variety near Chapingo, Mexico. (Photo: United Nations)

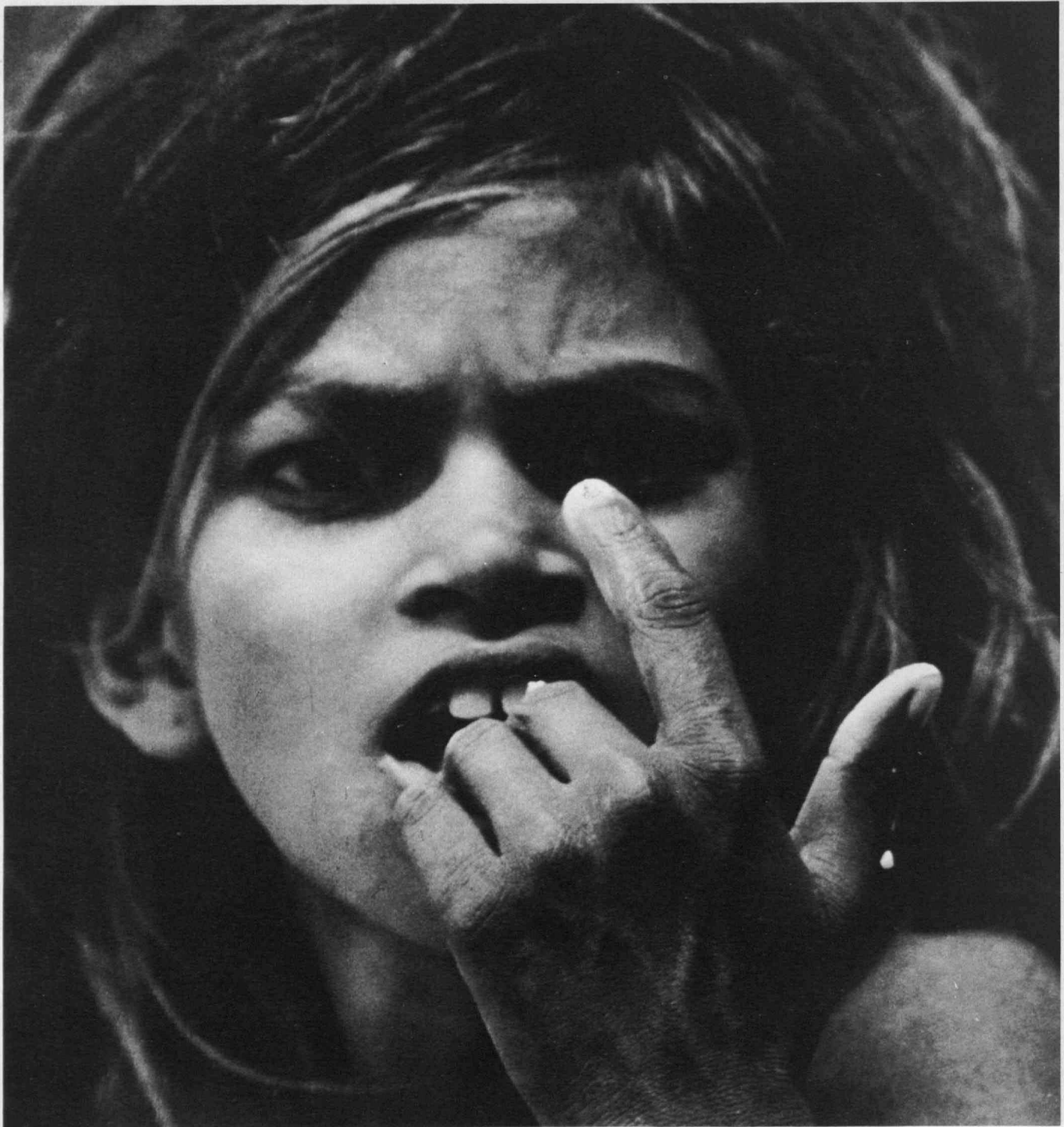
Another way of increasing the supply of protein is to raise more livestock. Pangola grass (near lower left) has increased beef production two to three times per acre in Brazil over that obtained with the ordinary Bahia grass. (Photo: USAID)

New types of rice are planted at an experimental farm in Gwegone, Burma (above). Oil seeds, groundnuts, and cattle fodder are also being studied. (Photo: United Nations)

A program of agrarian reform in Colombia permitted 80,000 families to purchase small farms in 1969. This small tractor (below) developed specifically for such farms helped them increase their production. (Photo: USAID)



A young girl from the state of Bihar, India, during the 1967 famine. Starvation or massive malnutrition are more crucial drawbacks to national development than lack of industrialization. (Photo: Alan Berg)



Malnutrition raises obvious questions in the realm of the food scientist. But issues of economics and public policy may be still more important in relating nutrition to national goals

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The Role of Nutrition in National Development

A few years ago the topic of nutrition in national development would probably never have been suggested. Nutrition was something nutritionists and food technologists worried about, but it was not a serious subject for those responsible for planning and operating development programs. The topic at hand suggests both how far we have come and how far we have to go.

There is no question that nutrition today is beginning to be taken seriously—seriously enough to engage the attention of an increasing number of policy makers concerned with development. But the interest is mixed with curiosity and the attention mixed with skepticism. We have, in short, reached the stage in the evolution of nutrition as a public policy issue when calling attention to the problem is no longer sufficient. It is now necessary to begin building a case—if such a case exists—for the position of nutrition in a development effort.

Stated another way: Why nutrition? Given the limited resources at the disposal of developing countries and the plethora of needs competing for these resources, why should a government budget programs to combat malnutrition? To the scientific fraternity the question may seem rhetorical: Why motherhood? But to planning commission members and finance ministry officials responsible for slicing the too-thin budget pie, the issue is neither clear nor simple.

Recognizing the Role of Nutrition

One difficulty is connotation. In many countries nutrition is viewed not as a development problem but as a welfare problem. This is not to suggest that welfare is ignored by development planners. Except in emergencies, it simply falls outside their primary focus of attention. Nutrition is typically not considered among the most important indicators of social, political, and economic development or among the priorities for national growth.

I sense, however, that the climate is changing. One reason for this is the matter of sheer exposure. Policy makers are reading and learning more about the magnitude and implications of malnutrition.

Second is the emergence of new technology which makes it possible to contemplate solutions never before considered plausible. Just as the development of new

seed varieties, pesticides, and fertilizers has created a revolution in agriculture, so might new fortification materials and techniques radically improve the current state of malnutrition.

The nutrition issue is also becoming more relevant—and remedial action more feasible—as countries make progress in reducing their grain shortages. India's wheat production has increased 53 per cent, Pakistan's 59 per cent, over what were record highs three years ago. Pakistan's wheat crop is up 59 per cent and Afghanistan's 40 per cent from 1960-64 averages. Over the same period, corn production in Latin America increased 28 per cent. Indonesia's rice production is up 28 per cent over the 1960-65 average; and the Philippines, with a 19 per cent increase since 1960-65, now grows enough rice to meet local consumer demands. Iran, which imported an average of 300,000 tons of grain annually until 1966, is now an exporter. This is all in sharp contrast to the common shortages and related famine projections of 1965-67 (see *"Food Supply: The Fruits of Research,"* by Sylvan H. Wittwer in *Technology Review for March, 1969, pp. 18 ff.*).

As a result, there will, for the first time, emerge increasing choice of land use in many developing countries. Should countries grow more grain for export? Should they use the land for other major export food crops? Should they expand agricultural production of industrial raw materials? Or should the land be used to raise more productive crops and improve the local diets?

Finally, nutrition is attracting the attention of the development planner today because of the new magnitude of projects being discussed—and the related costs. Except for charity child-feeding projects, nutrition programs in developing countries have generally been on a small scale. This does not mean there is a required correlation between the size of a budget and the significance of an activity. One senses, however, that years of economy-mindedness and working within the confines of overstrained health budgets—research efforts here, pilot programs there—have inhibited some of us from appreciating the magnitude of the opportunity. The situation today is different.

*The views expressed in this paper are personal and do not necessarily reflect the policies of the U.S. government or A.I.D.

This paper in fact starts with the premise that a massive attack on malnutrition—on a scale perhaps never before envisioned—could virtually eradicate major nutritional deficiencies just as smallpox and malaria have been overcome in much of the world.

Work on salt fortification now in progress in India, for example, has led to the preliminary conclusion that it will be possible to reduce significantly common iron deficiency anemia at a cost of less than \$4 million a year. Pilot research has demonstrated that calcium deficiencies can also be overcome through salt fortification—in this case without increasing the cost of salt. Large field studies to determine mass applicability of both iron and calcium fortification are now beginning in India. Similar research on vitamin A fortification, as well as mass dosage techniques, give hope that vitamin-A-related blindness can be prevented, and broad use of synthetic amino acids to conquer protein deficiencies is another area of promise (see *"The Potentials for Increasing World Protein Supplies,"* p. 37).

The costs for such programs—both the required research and the eventual implementation—will not be small, but if a strong enough case can be made, the resources could be made available. Is the problem important enough? Translated into the language of the development planner, is malnutrition an important enough obstacle to national development to justify re-routing resources now earmarked for other needs?

India offers an interesting backdrop in discussing these questions. Nutrition programs have aroused interest and have moved ahead in India in recent years. The current Five-Year Plan, for the first time, devotes a special section to nutrition. This document articulates a national nutrition policy and a \$78 million national nutrition program (2.5 cents per capita per year). Also, in India nutrition has a touch of development identity; people are beginning to talk and write about nutrition in a development context.

A point worth observing, however, is that of the three officials most responsible on the government side for moving nutrition into the foreground—the Minister of Health, the Secretary of Food, and a Member of the Planning Commission—each has quite a different set of reasons for supporting nutrition on development grounds. One relates nutrition to productivity and eco-

nomics development. The second views it in a broader social/political context, and the third sees better nutrition as an essential element in the solution of the population problem. It may be useful to examine briefly each of these points of view.

Economic Considerations

The first theme is that malnutrition is a drain on a nation's economy and is therefore a serious impediment to economic development. Calculations have been made by measuring the cost of raising a child (expenses of feeding, clothing, bedding, educating, and caring for the child), medical fees, employment lost because of illness, losses due to physical handicaps, reduction in working time and efficiency of the mother during child-bearing period, and maternal death losses. Other more general efforts have been attempted at cost/benefit analysis of health programs and at calculating the value of human life.

Satisfactory measurement of the economic drain of malnutrition per se is still to be made. To my knowledge, no body of economic theory has been developed which can comprehensively define nutrition's contribution to either national wealth or national welfare. Yet, though we do not know nearly enough about this, there is enough suggestive evidence to warrant mounting more comprehensive and systematic investigation.

An estimate of the economic drain of malnutrition might best begin with a consideration of death statistics. The mortality for Indian children four years old and under may be 250 per thousand, 50 times higher than in the United States; malnutrition in early life seems to be chiefly responsible for this high death rate. A suggestive analysis by E. Ghosh, worth bringing up to date, estimated that 22.5 per cent of the national income of pre-independence India was required to rear children who would not live long enough to make a productive contribution.

Today, 76 per cent of those who survive early death in India—408 million people—are in some way malnourished if one may judge by incomes which are insufficient to meet the minimum recommended allowances of the Indian Council of Medical Research. Certain age groups—regardless of income level—are subject to high incidence of nutritional deficiencies. Among the perpetually poor—about 160 million people with incomes of less than \$13 per household per month—virtually all members of the household suffer from malnutrition.

Physical retardation has been linked with malnutrition and it may be assumed this would have a bearing on the labor productivity of the survivors. This is clearly so in cases of physical handicaps, such as blindness caused by vitamin A deficiency. On the relationship of productivity to sheer physical size, however, a case is still to be made. I am not aware, at least, of data which prove that bigger is necessarily better.

A more important relationship than size to productivity would be energy to productivity. So far this relationship has not been adequately quantified in economic terms.



A Laotian woman grinds rice for her family. This sort of home milling, typical of the underdeveloped countries, makes fortification difficult because there is no central processing location where nutrients can easily be added. (Photo: United Nations)

However, those who have worked in South Asia would not dispute that such a relationship exists. One needs only to recall the blank and apathetic stare and the related sluggishness of performance so common in the subcontinent. One can view the resulting substandard productivity brought on in part by malnutrition as unfortunate but not in itself sufficient cause for budgeting a major nutrition program in a labor-surplus country. If it takes three men to do a single job, this may not necessarily be bad if there is only one job. In fact, spreading the employment may have certain social and political benefits.

Malnutrition and Mental Performance

Linking malnutrition to mental performance poses a different set of considerations. The major need of developing countries is an alert, creative, and intelligent citizenry which can expand existing opportunities and break traditional economic patterns. If future research can establish a significant relationship between malnutrition and mental development (see *"Mental Effects of Malnutrition"* by Peter Gwynne in *Technology Review* for May, 1967, pp. 23 ff.)—i.e., if a substantial enough portion of the population is affected badly enough—then a strong case linking nutrition to national development could be made.

For practical policy purposes the numbers affected and the extent to which they are affected is of greater significance than the more commonly discussed permanence or impermanence of the mental damage. Whether or not the damage can be undone, children will have lost learning opportunity during the most critical years of learning. These years cannot be relived. More important, the talk of retrieving mental powers assumes that people will later gain access to the necessary nutrients they now lack. This assumption can be questioned in India. A few figures will put this in perspective.

A composite examination of 220 Indian diet surveys,

when coupled with national economic projections, suggests that without a new nutrition strategy at least a generation will pass before many Indians can afford an adequate diet. The figures for states where income-differential nutrition data are available (Andhra Pradesh, Kerala, Punjab, and Madras) suggest that per capita disposable income must reach \$3.90 to \$5.20 per month to achieve an acceptable diet. About 80 per cent of rural Indians and 60 to 70 per cent of urban dwellers fall below this line. For one-third of India's families, at least twice the current income must be available if they are to attain adequate diets as a result of rising earnings alone. Given the optimistic assumption of a 3 per cent annual per capita real income rise, the required level cannot be attained in less than 30 years. Given population trends, this means a 5.5 per cent annual growth rate compared to a 3.5 per cent growth trend over the last 13 years.

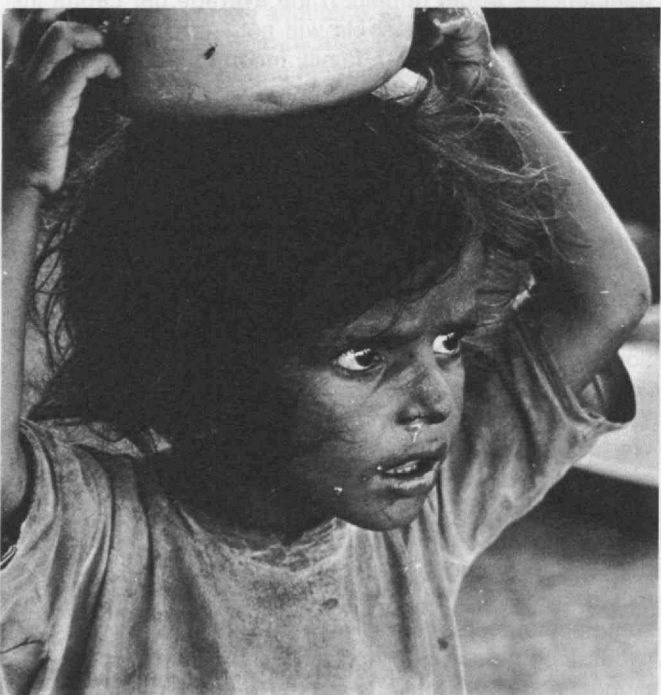
These calculations ignore unequal distribution within the group and within families. If, as we suspect, the deficiencies of preschoolers are proportionately greater than in other family members, double or even triple that income might be required to eliminate most of the deficiencies—and even then vitamin A and perhaps iron deficiencies would remain. If the average per capita income for 162 million people will not reach the minimum level until the year 2000, family income might not be high enough to meet the average preschool child's nutritional requirements for yet another 20 years. And that will still be average.

All this suggests we must place in proper context the issue of retrieving the mental ability lost through malnutrition. We must place in proper context, too, the proposition of some economists that nutrition is purely a result of income and that as incomes rise the nutrition problem will solve itself.

The Relationship of Diet and Income

We have seen that the increased income will be slow in coming to many. But we should not assume that an increased income will always be accompanied by better diet. In certain societies and at certain income levels a positive correlation between income and better diet exists. However, it has been my observation that in some societies there may be an inverse correlation between income and nutrition when income increases are modest and start from a low base.

A special nutrition and feeding program was instituted in Bihar during a famine in 1967. Governments of developing countries must be sure to pay special attention to the nutritional needs of children. (Photos: Alan Berg)



To many, an increase in money income offers the first opportunity to advance from a subsistence to a monetized economy. Suddenly ball-point pens and transistor radios compete for what previously had been a fixed food income. There is no definitive information on the correlation of nutrition at various stages of income growth. Although we know very little, we and others have noted that higher income—even though expenditures for food are increased—does not always lead to better diet. The classic example in India is the shift with the first increment of income from home-pounded rice to polished rice; the latter is aesthetically more pleasing but nutritionally less valuable. We have observed similar situations when increased income makes it possible to “buy up” from grain sorghum to rice and from unrefined sugar (jaggery) to refined sugar. A study in progress in the Punjab is showing that increased potato and corn consumption, often at the expense of normally eaten pulses, is one of the consequences of the agricultural revolution.

To summarize: We have noted a number of economic considerations relating nutrition to development. Although we do not yet know with any precision the relevance and significance of these relationships, preliminary work suggests they may be substantial.

Nutrition/Population Relationships

A second development hypothesis rests on the relationship of nutrition to population growth. Much of the family planning effort to date has been based on the premise that either ignorance or nonavailability of contraceptives is the cause of the population problem. An increasing body of opinion now suggests the bulk of births would occur anyway; that is, the parents consciously want more children, presumably to assure the the parents' support in their old age. A study last year in a village in the western state of Gujarat concluded that “families continued to have children until they were reasonably certain that at least one boy would survive. Once they had this number, they attempted to stop having more.” Even in the Punjab, which includes India's best nourished people (consuming nearly 50 per cent more food per capita than people in such states as Bihar and West Bengal), half the women over 45 years of age had lost at least three liveborn children. Only one woman in seven had lost no children.

A recent computer simulation reveals that with current

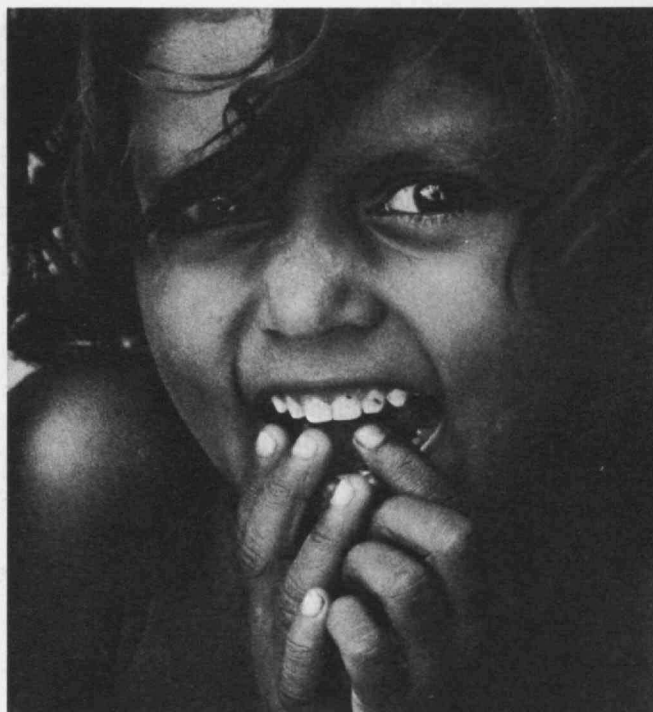
estimated infant and adult death rates in India, a couple must bear 6.3 children to be 95 per cent certain that one son will be surviving at the father's 65th birthday. The average number of births in India per couple is 6.5, which tends to support the thesis that parents do continue to bear children until reasonably sure of the survival of at least one son.

It is the combined reality of desire for adult sons and high child mortality that poses the crux of the population dilemma. This suggests paradoxically that possibly the best way to lower population growth is to keep children alive.

Although the above studies provide no assurance that lowering infant death rates will result in declining birth rates, the evidence is suggestive enough and the problem important enough to encourage major research. For the moment, one might offer the hypothesis that family limitation cannot be successfully promoted and will not be widely accepted without concurrent and coordinated programs designed to improve family survival.

In addition to the approach of improving nutrition to decrease birth rates through decreasing child mortality, attention also is being given to the specific operational use of nutrition programs as incentives for use of family planning services. In some areas there has been reluctance, even resentment, against the negative implications of birth prevention. The care and concern for the living child, expressed through certain kinds of nutrition programs, could open the door, the theory goes, to family planning education opportunities and perhaps an increased receptivity to birth control practices.

Recovery from malnutrition is often quick and dramatic. A mother presumably would be receptive to advice from any person who could rapidly improve the health of her child, and if that advice includes family planning, the opportunity for influence is apparent. A current Johns Hopkins rural health research project in the Punjab reports that "the dramatic improvement in a child with marasmus has almost more impact on (our) general rapport and relationships with village families than anything else which we have tried to do in active medical care. The change in the children is so obvious and the whole process is so readily understood that such efforts do lend considerable credibility to what our village workers say on other matters."



Clearly a large and effective nutrition program cannot be conducted in the absence of or in isolation from a family planning effort. It should be recognized, however, that in some countries an effective planning program may be difficult if not impossible without better nutrition. A policy of pursuing either alone may eventually prove untenable. But, as with the productivity argument above, there is still much to learn.

Social/Political Factors

Economic development, and all it implies, is but one facet of development. Also required for national growth is a suitable social/political environment—a tolerable human condition, basic social justice, the opportunity to improve one's lot, that complex of things which keeps a society viable. We have seen recent instances in South Asia of considerable social disruption, sometimes verging on upheaval. A government cannot develop economically in that kind of social structure.

This suggests that the case for nutrition can and should be argued on other than economic grounds alone. Since we sometimes are at a loss to cope with the noneconomic factors, we tend to retreat into mechanistic input-

output relationships of the macro-economic model. Society, however, is not a petrochemical plant.

In India, for example, we are beginning to recognize that the agricultural revolution—for all its accomplishments—does not present a final development answer, at least for the present, for a large mass of the population.

As indicated earlier, domestic food production is reaching proportions which permit less dependence on food imports. The new Indian Five-Year Plan projects food self-sufficiency by 1972. However, adequate distribution of the additional income generated is not assured. Early research tentatively concludes that the agricultural revolution may, in fact, aggravate the income distribution problem. Further, there is no basis for optimism that those not now participating in the increased production will soon benefit.

The barriers to them are not only social (poor education, low productivity levels) and economic (a poor financial base to begin employing improved seeds, fertilizer, and pesticides), but also geographic. A look at the Indian poverty map shows that most of the very poor are concentrated in areas lacking assured rainfall or irrigation, and it will take many years to build the water infra-structure necessary.

National Development and Quality of Life

The proposition here is that national development cannot take place without a sense of participation on the part of those hundreds of millions who are now excluded from economic benefits. The difficulties in achieving this are well known. In essence, the issue is how best to increase the standard of living in ways which have important long-term benefits.

The ideal activity should give maximum benefit to the widest possible audience for its cost. It should offer relatively swift results with a minimum of undesirable side effects (e.g., inflation). It should meet a real and important need and bring permanent benefits, clearly visible to the beneficiaries. When setting against each of these criteria the more obvious ways of bettering the human condition, improved nutrition stands as an attractive possibility.

As a final rationale, I suggest that development in its broadest context might be defined as upgrading the

quality of human life. To achieve this end, most of the national development efforts, as well as most major foreign assistance programs, have in the past 15 years concentrated on economic development.

Generally the goal has been to increase wealth which in turn would increase purchasing power, improve the social services, and raise the quality of life itself. Part of the dogma is also that the happier life would lead to a more politically stable life—and hence, as the crowning achievement of the economic development process, to a safer world. If a critical ingredient and a major objective in the development formula is to improve the quality of life, can we shortcut the process?

The common approach to economic development is to concentrate on highest return per unit of investment, and the unit of accounting is increase in national wealth. If, instead, indicators reflecting the quality of life might be included in the units of measure, a different ordering of priorities may result. What this proposition asks, in effect, is whether greater emphasis on activities such as nutrition, balanced with a more tempered attitude to increasing the gross national product, might in some instance permit us to achieve our primary goal more rapidly.

This, too, is an area which may deserve exploration.

In summary, there are a number of indications that malnutrition is an obstacle to national development. At almost every turn, however, there is a shortage of hard scientific evidence to support this proposition. This leads to two alternatives: We can continue the attempt to sell nutrition on nondevelopment grounds, suggesting, for example, that the human tragedy of malnutrition is itself valid grounds for large programs and large budgets, that better nutrition is a moral imperative; that children should not have to justify their sustenance on grounds of societal economic development. "We should be concerned not because nutrition provides development benefits, but because it is right." My personal judgment is such arguments will be insufficient to claim a much larger portion of development resources.

The other alternative is to encourage major research to validate suggestions about the real relation between nutrition and national development. The government policy maker wants—and deserves—to know answers to some hard questions: How much more productive is the properly nourished man? How much more will a man with full mental and physical capacities contribute to society? What does malnutrition cost society through waste in bearing and rearing children destined for early death or in support for those whose productive years are curtailed? What are the implications of better nutrition upon family planning? What are the social and political implications of better nutrition?

Beyond these things, of course, the official wants to know the true magnitude of malnutrition in his country—both today and as projected into the future. He wants his projected agricultural production translated into nutrients and examined against the need based on future population estimates. He wants to weigh the alternative

Population, Food Supply, and Economic Development



means of meeting the shortage—with an eye on cost/time/impact factors. Should there be more reliance on education? Is the answer increased food production? If so, what are the land-use implications? Is the answer reorientation of agricultural research—more emphasis on pulses, less on cereals? Is it a change in government pricing policy? A new distribution and marketing mechanism? Fortification? Large scale child-feeding programs? New foods? Should the government deliberately subsidize diets to correct the errors of consumer decision making? If so, how and to what extent?

In short, what is holding back nutrition as a major force in development is not so much a technology lag as a social science lag.

A member of India's Planning Commission said in an interview last month that the basic problem of projecting nutrition into the mainstream of development is that those interested in nutrition have been asking the wrong questions and looking for the wrong answers. There had been, I was told, nowhere near the kind of analysis given to nutrition as had been given to agriculture or family planning. As a result, the nutrition advocate was handicapped in the sharp competition for limited resources.

One can conclude from all this that there is a need to establish a new dimension—and new discipline—in nutrition. The immediate requirements are two: first, a large, well-funded, high-quality policy-oriented research program engaging nutrition scientists and social scientists as well as people with operational experience to study the relationships of nutrition and national development; and second, a group of programmers and specially trained field operatives to plan and implement mass programs once public policy has been determined.

Without answers to the central policy questions, it is doubtful if our help in combating malnutrition can be more than at the borders and edges of the problem—a problem still considered of fringe importance by the development planner.

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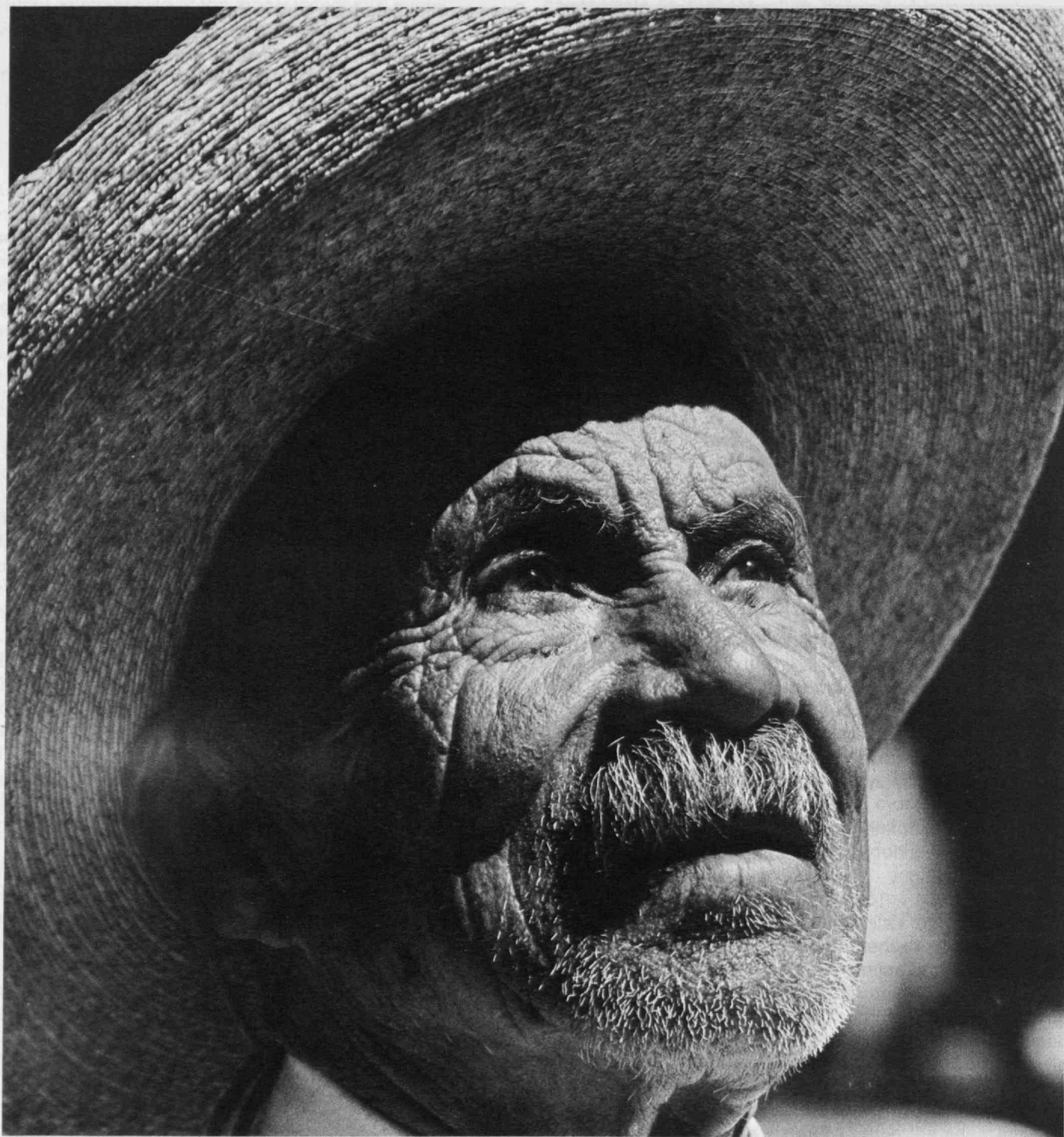
Alan Berg is Chief of Food and Nutrition for the Agency for International Development in New Delhi. He formerly served in Washington as Deputy Director of the Food for Peace Program and as co-chairman of a task force on combating foreign malnutrition. In 1968 he received the Jump Award, given by the U. S. government to a civil servant under 40, "for outstanding achievement in advancing mutual understanding between the United States and India, for assistance in averting famine in Bihar, for encouraging the government of India to mount a serious campaign against child malnutrition, and for stimulating the Indian food industry to become an effective instrument for improving Indian nutrition." This year he will become a Belding Scholar and a Senior Fellow of the Brookings Institution.

Increased agricultural output, the green revolution, may not keep pace with population growth for very much longer, and other economic conditions may also work against its effectiveness. An old man from Mexico. (Photo: United Nations)

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Generally the goal has been to increase wealth which in turn would increase purchasing power, improve the social services, and raise the quality of life itself. Part of the dogma is also that the higher life would lead to a more politically stable life—and hence, as the growing achievement of the economic development process, to a better world. If a critical ingredient and a major objective in the development formula is to improve the quality of life, can we direct the process?

The common approach to economic development is to



A nation's nutrition is inextricably bound to its economic health. Yet for a country to improve the quality of its diet, more is demanded than simply economic growth; specific nutrition strategies are also needed

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Population, Food Supply, and Economic Development

In 1961, at the urging of President John F. Kennedy, the United Nations declared the 1960's to be the "Decade of Development." The General Assembly passed a variety of resolutions in that year with the intention of stimulating economic progress in the underdeveloped countries during the decade. A target was established: that by 1970 the gross national product of each of these countries—the total output of goods and services—would be growing at a rate of 5 per cent per year. To make this possible it was proposed that the developed countries increase their capital contribution to the resources available to the underdeveloped countries. An amount equal to 1 per cent of national income of the developed countries was established as a reasonable target for resource transfers of all kinds to the less-developed nations. This amount was intended to include foreign aid, private capital investments, and surplus food transfers.

Now, as this decade closes, there is a mounting feeling that the progress of the less-developed countries has been inadequate. This sense of inadequacy has two sources. Economists who have been following closely the progress of development itself by the usual economic indicators suggest that development has not been fast enough to improve standards of living in the underdeveloped world. Economists and nutritionists concerned with food and nutrition feel that there is a growing disparity between the expanding population of underdeveloped countries and their efforts to increase their available food supplies.

As we approach the end of the first "Decade of Development," there is a scurry of preparation for a new effort for the 1970's.

The Commission on International Development, headed by Lester Pearson of Canada and appointed by the International Bank for Reconstruction and Development, has now reported on what will be required for the advancement of the underdeveloped world in a "second development decade." Each specialized agency has developed its own plan: the World Food and Agricultural Organization, the International Labor Organization, the U. N. Conference on Trade and Development, and the U. N. Organization for Industrial Development, among others, have all set goals. These reports will be coordinated next summer when the United Nations General Assembly considers a program for the 1970's.

An examination of American aid programs is underway in the United States. President Nixon has appointed the Peterson Commission to review the whole structure and organization of our foreign aid effort and to make recommendations to him and to the Congress by the end of this month.

Why this new concern with an accelerated pace of development in a "second development decade?" Was the first a failure? Is it now necessary to find reasons for its failure and to correct the errors?

The answer to these questions is no. The "Decade of Development" was not a failure; it was an overwhelming success—a success in its own terms. The records of the less-developed countries (we have information, some of it statistical, about most of the non-Communist countries) will probably show that the average rate of growth of their gross national products during the 1960's was slightly more than 5 per cent per year. For the transfer of resources from developed to underdeveloped countries, the target of 1 per cent of national income has very nearly been reached, according to the Development Advisory Commission of the Organization for Economic Cooperation and Development. The O.E.C.D. members—the nations of Western Europe, Japan, and the United States—have averaged about 0.96 per cent of their national incomes. However, at the U.N. Conference on Trade Development in New Delhi a year ago, the target was raised from 1 per cent of national income to 1 per cent of gross national product—some 20 to 25 per cent more than the previous target. We are now nowhere close to that. The United States is only eighth or ninth in the proportion of gross national product devoted to resource transfers, both private and public, to the underdeveloped countries. France, West Germany, Great Britain, Holland, Denmark, and Austria are well ahead of us, despite the fact that we are more than twice as wealthy per capita as any of these countries.

*This article is based on a seminar given by the late Professor Millikan to the Department of Nutrition and Food Science at M.I.T. in November, 1969. Following Dr. Millikan's death on December 14, it has been prepared for publication by the Editors of *Technology Review* with the assistance of Donald L. M. Blackmer, Associate Professor of Political Science, who is Acting Director of the Center.

These two graphs show the distribution by age of the populations of the underdeveloped countries (left) and the developed ones (right). The former shows its greatest bulk in youth; the largest numbers represent children who may not even now grow to productive maturity. The latter shows a more balanced proportion, in which children who are fed and schooled live to put energy back into the economy.

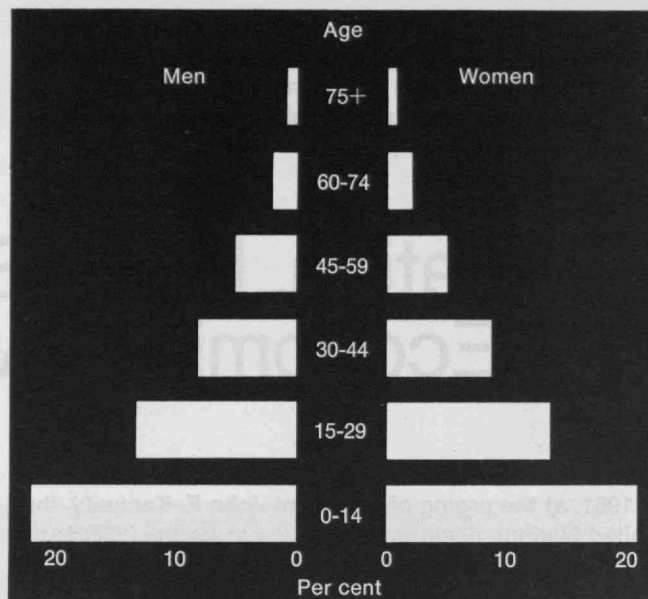
Economic Growth vs. Agricultural Productivity

In historical terms, the 5 per cent rate of growth achieved by the underdeveloped countries is a remarkable performance. It vastly exceeds anything achieved by the developed countries in the comparable periods of their histories during the nineteenth century; none grew at a rate as high. The average for the United States and Western Europe was 3 or 3½ per cent per year at the end of that century. So this is, in fact, a development record in which to take pride.

And within this average of 5 per cent there are some countries that are really almost successful; some of them seemed, a decade ago, without hope. The common view of South Korea, for example, was bleak indeed. Yet South Korea has grown over the last five years at close to 8 or 9 per cent per year—perfectly extraordinary progress. Taiwan, Iran, Mexico, and Pakistan have also achieved remarkable growth.

If, in fact, we have had this rather extraordinary performance during the 1960's, what explains our unease as we begin the 1970's? Two or three years ago, essentially two problems were recognized as crucially inhibiting a more rapid growth of per capita income in the underdeveloped countries. The first was the unprecedented explosion—no other word is appropriate—in their populations, an explosion which has literally eaten up their substantial increase in output. This is an explosion which has no historical parallel, a rate of population growth much more rapid in the past few decades than ever existed in any of the presently developed countries. The second problem is that, in spite of a very substantial rate of growth in many aspects of these countries' economies—growth in their industries, and transportation and communications networks, there has been a lag in their agricultural productivity. Agriculture has not kept pace with the growing demand for food.

Within the last two or three years, we have had a number of encouraging developments in both population control and agricultural productivity. Now two quite different worries arise. The first is that unless the general growth in per capita income is accelerated beyond the level of the 1960's, it seems unlikely that either advances in population control or expanded prospects for food supply, which now look so promising, can be realized. Though the aggregate growth rate was about 5 per cent, the growth in per capita income was between



2 and 2½ per cent per year in this decade; the population growth rate was about 2½ to 3 per cent, so less than half of the 5 per cent growth was free to increase per capita standards of living. But even if development is accelerated, even if the rate of growth of per capita incomes is increased to the U.N. goal of 4 to 4½ per cent per year, this rate of increase will not by itself confront these countries' crucial nutritional problems.

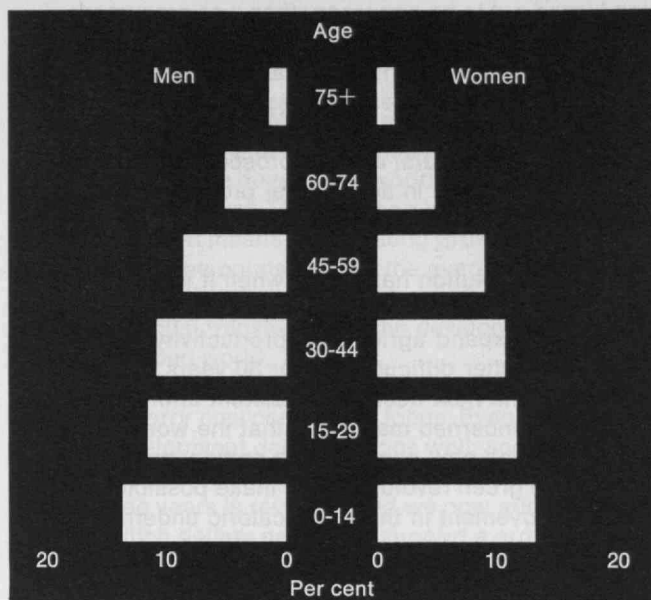
This is my second worry. Specialists in economic development have tended to assume that rising incomes would naturally improve nutrition. It is now increasingly apparent that quality of diet will not be improved rapidly enough if nutritional problems are left to the normal process of economic development. In other words, development plans must now contain specific nutritional strategies.

From a Century to a Year

Perhaps we should now briefly review some statistics of the population explosion. Every population curve has a sharp corner in it—a change from moderate to very rapid increase. There are a number of ways of dramatizing this. One of my favorites is that until roughly the year 1600 the rate of population growth in the world at large was of the same order of magnitude per century as it now is annually.

Acceleration of world population began around the year 1600. By 1900, the growth rate was about 1 per cent per year; between 1900 and 1970, population was multiplied more than 2½ times. The rate of population growth in the world now averages a little more than 2.5 per cent per year. The increase in the underdeveloped world is very close to 3 per cent; in some countries of Latin America, it reaches 3½ per cent. There is added to the population of India each year a Belgium—approximately 12 million people a year.

We can now explain why a 5 per cent growth rate in overall gross national product for underdeveloped countries produces such an unsatisfactory rate of growth and living standards, compared with the relatively satisfactory rate of improvement produced by a 3 per cent



growth rate in the United States in the nineteenth century. Because we had only 1 per cent population growth, we realized a 2 per cent per capita income growth. In contrast, of the 5 per cent growth rate in today's underdeveloped countries, nearly 3 per cent is used merely to provide food, housing, and clothing at a bare level of subsistence.

Birth rates have thus far contributed very little to the changing rate of population development. Infant mortality is still high. The large decline in death rates has been the result of a decline in the principal communicable diseases of childhood and adulthood, such as malaria and scarlet fever. Infant mortality, which is very closely related to malnutrition, is still very high. In human terms, this is a great deal of suffering. But in the cold-blooded terms of economic efficiency, this is an enormous amount of waste because a large fraction of the population brought into existence and fed in its very early years never reaches its maturity in intellectual or physical productivity.

Several years ago, the common impression, based on anthropological literature, was that motivation was the basic problem in population control. It is now recognized, however, that there is much greater demand for the limitation of births among all populations than we had believed. However, despite this favorable indication, the new programs now being inaugurated will be slow to reduce the population growth rate even if they are mildly successful. Indeed, our best hope is that by 1980 the population growth rate of the less-developed world will not have significantly increased above its present level. Even this should be regarded as a triumph if it is achieved.

Population control takes time. And during these decades the composition of the populations remaining in the world will be altered; there is already a substantially larger fraction of child-bearing mothers than existed eight or ten years ago. The aggregate birth rate per 1,000 will increase because the number of mothers of child-bearing age in that 1,000 will be significantly higher.

The present view is that the birth rate tends to follow the death rate down after a lag of several generations. The primary motivation for having a large family is to provide some assurance that the parents will have at least a single grown, male son. We may hope, then—if infant mortality is reduced through improved medical care and nutrition—that the motivation for having large families will be correspondingly reduced with a lag of several generations, and that ultimately the population explosion will be controlled. This will probably take 20 or 30 years. A further complication is that we have no satisfactory and uncomplicated methods of contraception which can be widely disseminated without more medical expertise than we now have.

For several reasons, therefore, the prospects of a significant drop in the population explosion over the next decade are not very good, although the prospects over 30 to 50 years look quite promising. Does that mean desperate problems for the 1970's? I do not believe so, because we have also had a breakthrough in agricultural productivity—the green revolution—which may permit us to stay ahead of the population explosion for at least the next decade.

Until about 1955, agriculture barely kept ahead of population in the underdeveloped world. Its rate of growth was about 3 per cent per year, and population growth was only about 2½ per cent. But that ½ per cent lead was not enough, because it existed amidst gross malnutrition. As people's incomes rise in these underdeveloped countries, they spend a substantial fraction of the increase on more food. There is a useful equation for this relationship. It is: $F = p + \gamma y$.

In this expression, "F" represents the annual rate of growth in the demand for food, in per cent per year; it is determined partly by the rate of population growth—"p"—in per cent per year. The other determinant is the increase in the demand for food which results from rising income. If "y" represents the per capita rate of growth in incomes—this is not just cash income, but the value of everything consumed—and we then multiply that by the "income elasticity of demand" for food—the ratio of one per cent by which demand for food rises when income rises by one per cent—we obtain an indication of how food demand is related to both population and income. For example, if the rate of population growth p is 2.5 and if we hope for a growth in per capita

Gross national products, levels of populations, and per capita incomes for regions of the developing world are listed below. The total gross national product for the areas shown is \$284 billion, the total population is 1,564 million, and the average per capita income is \$182. (The data was taken in 1965.) The United States at that time had a population of 194 million and a gross national product of over 630 billion.

	Gross national product (billions of dollars)	Per capita income (dollars)	Population (millions)
Near East (excluding Greece and Turkey)	23.3	263	88.5
Latin America (excluding Brazil)	69.0	447	154
Far East	35.7	129	276
India, Pakistan, Brazil	82.4	120	686
Tropical Africa	22.9	107	213
North Africa	7.0	225	31.3
Rest of South Asia	3.7	100	37.0
Greece, Turkey, Spain, Puerto Rico, and miscellaneous	39.9	534	78.4

income of about 3.5 per cent, the income elasticity of demand—the percentage increase in food consumption which will result from a 1 per cent increase in incomes of about \$100 per year—is about .66, and this means that the growth in food demand under these circumstances is roughly 5 per cent per year, of which about half is to meet population growth and half to meet the growth in food demand from rising income.

In the 1960's, "y" was about 2.5 and therefore the growth in the demand for food was roughly 4 per cent per year. The growth in agricultural productivity was only slightly above 3 per cent per year; the difference was made up by transfers of food from the developed countries.

But finally this lag in agriculture began to hold down overall economic growth. This was dramatized by the crisis in 1965 and 1966 when two bad monsoons led to a severe threat of famine in India. Only massive shipments of surplus food from the West averted disaster. The most important consequence of the bad harvests was not the increased shipments from the West; rather, it was to bring home to officials in India and throughout the underdeveloped world the importance of planning for agricultural productivity. Just at this time came the green revolution, and the new varieties of wheat and rice won rapid acceptance. Indeed, much less adapta-

tion turned out to be necessary than was presumed; particularly the wheats have done extraordinarily well in Pakistan, India, the Philippines, and elsewhere, and even the rices have been successful. Agricultural production has grown at 6 or 7 per cent per year for the last two or three years, and the prospects for the continued rapid growth in agricultural productivity are now quite favorable.

The green revolution has limits: when it is fully exploited, there will be once again the problem of how to continue to expand agricultural productivity. Thus we may have further difficulties 20 or 30 years hence. But, at least for the next decade, consistent effort on the part of all concerned may mean that the world's food production can stay ahead of the population explosion. Indeed, the green revolution may make possible a slight improvement in the gross caloric undernourishment; perhaps half the rate of growth of food production can be devoted to increasing per capita levels of consumption.

Prosperity as a Condition for Productivity

Now the two concerns which I described at the beginning become more evident. If incomes do not grow, there will be no increase in the demand for food. If incomes increase more rapidly than 3 per cent, the demand for food will rise more quickly. As incomes rise and diets become more adequate, the income elasticity demand for food falls off. There is a very real prospect that if nonagricultural incomes do not go up by 7 or 8 per cent per year in the less-developed world, the green revolution will be aborted. One of the reasons it has taken hold so quickly is that the lag of food production behind incomes during the 1950's and early 1960's made farming relatively profitable. The two bad Indian monsoons particularly had this effect. Food prices have been high because there has been demand from the non-agricultural population for substantially more food than agriculture has been able to supply. If that demand is not sustained and a surplus occurs, the green revolution can be stopped in its tracks.

A crucial aspect of the new agricultural technology is that it requires purchased input by the farmer. The new rices and wheats do well only with heavy doses of fertilizer and with more water, usually from irrigation, than traditional strains. Farmers will not buy fertilizer and irrigation water if the price drops out of the market for farm products—the situation that existed before the bad monsoons. Farming has changed from a subsistence activity to a commercial one; farmers must be able to sell their products to nonfarmers to have the cash to buy the raw materials needed to grow their next crop. That will only be possible, of course, if the non-agricultural population has more money to buy food.

Nonfarmers in turn cannot buy more food unless their productivity goes up—and the nonfarm productivity can only go up if there is an ample supply of capital from a foreign exchange. This means accelerated foreign aid from the developed countries. And the trend in transfers has not been encouraging in the last few years. The United States program has been sharply cut in each of the last three years; we now devote only .3 per cent of

our gross national product to aid, compared to the United Nations target of 1 per cent.

The Interrelations of Nutrition and Economics

The United Nations and the Pearson Committee have determined that the developing world needs a growth rate of 6 or 7 per cent. This is not an impossibly ambitious target—it means accelerating growth by only 1 or 2 percentage points beyond the average achieved for the 1960's. What it does mean is a substantial increase in capital transfers from the developed to the underdeveloped world.

My fourth worry now comes into focus. Even if the second development decade begins well, and even if particularly the American aid performance of the last two or three years is reversed and we now add the several billion dollars needed to support a growth rate of 6 or 7 per cent, the question still arises: What will happen to nutrition? Will improved nutrition not naturally follow?

One point must be made to nutritionists: Without high economic growth there is no possibility of improving nutrition in the underdeveloped world. So those whose basic concern is with improved nutrition must also get behind the efforts for generally expanded economic development.

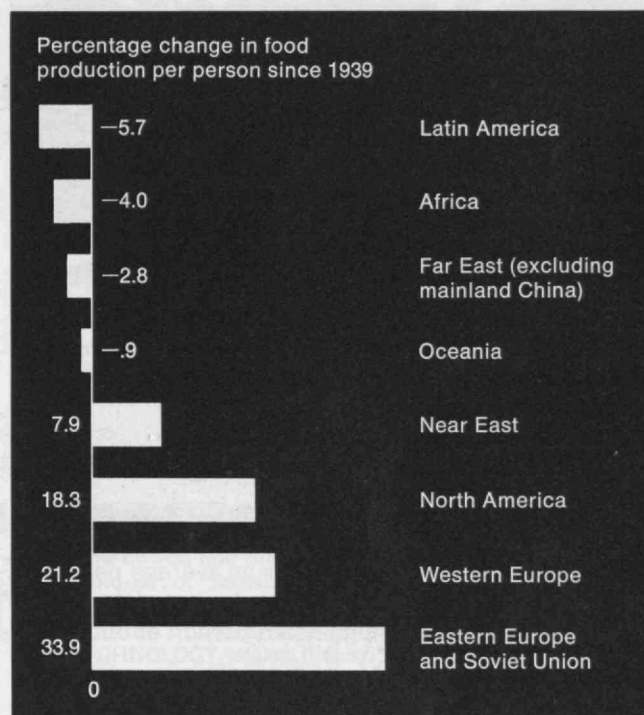
A second point must be made to developers, whose basic concern is economic development, timing, and strategy: Without a specific nutritional strategy, a rising level of income will not by itself alleviate the nutrition problem.

It is quite clear that, at an income level of \$75 to \$100 a year—this is not cash income but value in market terms of everything consumed—it is impossible to provide enough simple calories. And it certainly is not possible to provide any increase in the quality of the diet. The higher the rate of growth of per capita incomes, the larger the fraction of any increase that can go into improvement of quality. At a very low increase in income the increase goes simply into increasing the bulk of caloric intake. It is only as incomes rise substantially more rapidly that people are enabled to purchase a little bit of milk or a little bit of meat.

There are many subtler connections between economic development and improved nutrition. In underdeveloped countries, which still have largely subsistence economies, there is no commercial access to a farmer's food supply if he grows it on his own land and consumes it all himself. There is no food processing industry and no way to introduce additives into his diet to improve its protein content. If a farmer does not buy seed, there is obviously no way to supply him with a higher protein yield.

One of the main accesses proposed to children's nutritional problems is through school lunches. But education rests on development. And if children are not in school they obviously will not eat school lunches. If per capita gross national product does not exceed \$75, there are not the resources to support universal primary

This equilibrium in food per person is not spread evenly across the world, however. Since 1939, some regions have increased their supplies drastically, while others, the underdeveloped ones, have lessened theirs.



education.

I thus conclude that improved nutrition is not possible without rising incomes.

But now I want to argue the other side of the case, to explain to economists why they must consider a special nutritional strategy even if incomes are moving up. It is true that increased incomes will mean better nutrition after a time, but this process is slow. For example, at \$100 per capita you need all the land available to produce grain for direct human consumption simply for minimal caloric intake. If your nation chooses to obtain its calories by feeding grain to animals, it will use five to seven times as much grain to produce a calorie of animal protein. This has economic as well as agricultural implications.

To rely on traditionally preferred animal proteins, purchased in the market, means that a significant effect on protein nutrition cannot be obtained unless incomes rise to \$700 to \$800 per year. At the current 2 per cent per year target rate an eight-fold multiplication of income will take a century. We cannot wait a century to elim-



Great disparities in the quality of living exist in the underdeveloped world—these two scenes were both photographed in Bangkok. Unless the rate of growth of these countries increases considerably faster than it does at present, these disparities will only grow. (Photos: United Nations)



inate nutritional deficiencies, particularly in the school-age children. Even if incomes were good, we are aware that, in the United States, which has an average per capita income of \$4,000 per year, we have serious nutritional deficiencies in a significant portion of our population.

All indications are that the maldistribution of income in the underdeveloped world will be worse before it is better. The agricultural areas affected by the green revolution may progress quite rapidly, but this affects only 10 to 20 per cent of the rural population. Only a limited fraction of the people for whom the green revolution is appropriate have access to it, for the new grains will grow only with abundant irrigation, with fertilizers, and on certain types of soils, and these are not present in many parts of the underdeveloped world.

So the green revolution will mean an increased disparity in the incomes in rural populations. Concern exists for urban populations as well: the growth of industry is proceeding too slowly to provide employment for the large numbers of people being released from agriculture and flooding into the cities. Unemployment has been rising in the underdeveloped countries, and studies by the International Labor Organization and other agencies estimate that even with industrial growth rates at 7 to 9 per cent per year, the capital requirements in industry are so heavy and the number of new workers per dollar of new capital so small, that employment prospects outside of agriculture for this burgeoning 2½ per cent population growth are not good.

Toward a Nutritional Strategy

What does this mean for nutrition? It means that the disparities in income will tend, within averages that are already very low, to be greater rather than smaller in the future than they have been in the past.

This demonstrates to me a case for explicit government programs to provide nutritional supplements, particularly for infants and for mothers, in the entire population. These supplements must be provided outside of normal market channels because, distributed through normal market channels, they will not reach the right people in the right quantities. We desperately need a nutritional strategy in the development plans of the underdeveloped countries. Fortunately this is beginning to be recognized—India's Fourth Five-Year Plan includes a chapter on nutrition. This has not happened before. It is coming to be recognized that more explicit attention needs to be paid to institutional and organizational devices for insuring that the next generation of children is not subjected to impossible handicaps—permanent deficiencies, both mental and physical—because of the failure to deal with the nutrition problem.

Max F. Millikan, whose career was ended prematurely on December 14, 1969, had been Director of M.I.T.'s Center for International Studies since its founding in 1952. He was widely known as an advocate of international aid from developed to underdeveloped nations for humanitarian as well as economic reasons. Dr. Millikan held degrees from Yale University, had served with the Department of State and Central Intelligence Agency, and had been a consultant and adviser to many national and international groups.

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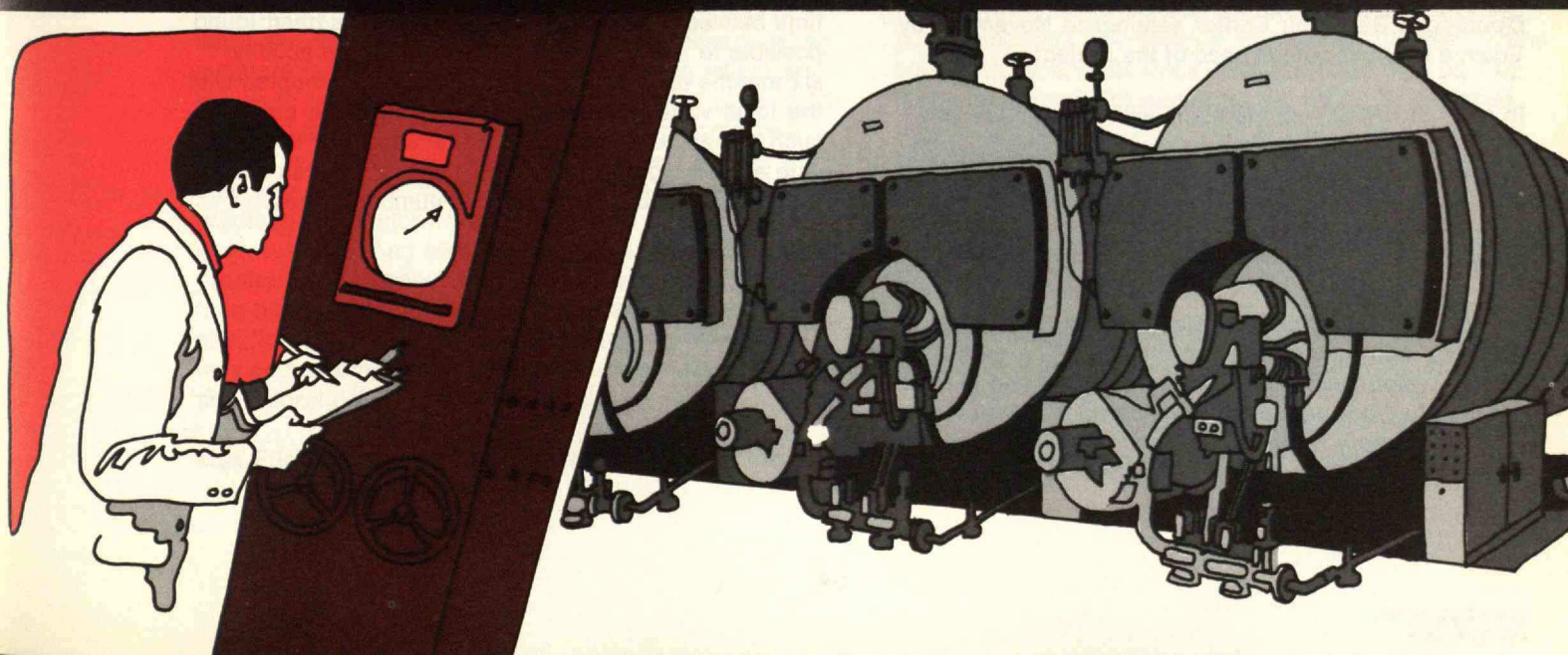
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Trend of Affairs

Alarms, Excursions and Slippery Water

Among the tasks which Mayor John Lindsay gave to the RAND Corporation in January, 1968, was to improve the effectiveness of the New York City Fire Department. The total cost of all the RAND projects for New York City—between \$2.5 and \$3 million a year—seems to have been justified many times over by only one of the findings: that friction-reduction agents such as polyethylene oxide, added to the fire-fighters' water, eases the work load by an amount equivalent to one man per company, which with overhead will add up to \$20 million a year.

The New York City Fire Department suffers from essentially the same problems as other big city fire services, if unusually severely: an increase in incendiary fires and false alarms; a rash of major fires in unoccupied buildings; a dwindling desire to work in fire companies on the part of the middle class; and occasional open hostility among the underprivileged.

The system is showing signs of breaking down under the rising alarm rates. Equipment is antiquated, dating in its technological basis from the early part of this century. And systems have only recently been proposed to open up the main bottleneck, which is between the alarm and the excursion.

RAND's progress to date was outlined at an M.I.T. Operations Research Center seminar in November by Edward H. Blum, who is head of the project.

In spite of RAND's connections with the military and space industries, a search for useful "spin-off" from military to civilian projects two years ago yielded little of apparent practical value. (Indeed, most military fire fighting is based on civilian practice, and the armed forces are now showing interest in the RAND advances.)

But it was found possible, said Dr. Blum, to interest chemical and instrumentation companies in undertaking large development programs, to get a foothold in a market they had not previously considered as an outlet. A leading example is the use of chemicals which, in trace amounts, reduce the turbulent viscosity of water by

some 70 per cent. For a given flow-rate and pressure, the hose diameter can be reduced from the standard 2½ inches to 1½ inches. The gain in maneuverability is such that this apparently minor change, costing \$100,000 a year in additives, should be worth \$80,000 a year to each of New York City's 240 fire companies: in all, \$20 million; 160 new pumper vehicles, incorporating the change, have already been ordered. Incidentally, the question of whether some other fluid might be a better general-purpose fire extinguisher than water was investigated, and water proved to have a clear lead, especially in applicability, availability, and cost, over the recent innovations in this field.

The incidence of fires—and also of false alarms, and of alarms in general—is subject to great geographical and temporal variations. The geographical pattern reflects, with new precision, what firemen have long known in a general way: the amount of work that a district provides is related to the district's "quality." Close study reveals that certain indexes, such as the proportion of alarm calls which prove false, appear to reflect the rate at which social changes are occurring. Thus, an area such as the Tremont district of the Bronx—presently undergoing rapid changes—has a rapidly climbing false-alarm rate, which now exceeds the high but stable false-alarm rate of Harlem. Some indexes may indicate "quality" changes even before the inhabitants themselves have noticed a difference.

The main features of the temporal pattern are a large seasonal swing and a very large daily variation, superimposed on a steady exponential climb with a doubling time between seven and eight years. It has been found possible to make good predictions of alarm activity six months ahead. Not only do these data, coupled with the local variations, make possible strategic planning such as has not hitherto been attempted, but they provide a basis against which the researchers can evaluate measures intended to reduce the number of fires.

Debbie and the Hurricane Seeders

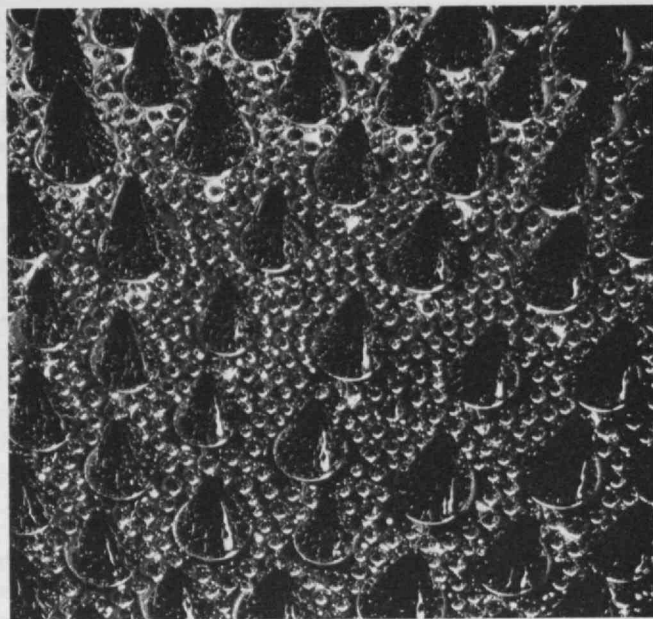
Certain primitive societies, specializing in song, dance, and prayer, have in times past evolved from these elements weather-modification rituals which were held to be effective. The modern approach combines aviation with inorganic industrial chemistry. Under certain conditions, silver iodide particles stimulate nucleation in clouds, and hence rainfall. Project Stormfury, begun in 1961 and funded jointly by the Departments of Commerce and Defense, tries the same technique on hurricanes.

The major such effort of the past summer was the seeding of Hurricane Debbie. In five two-hour flights on August 18 and another five on August 20, a total of 135 kg. of silver iodide was aimed at the wall of cumulus clouds around the core of the hurricane. On the middle day the air crews reportedly took a needed rest. Data on temperature, pressure, humidity, liquid water content, and wind were recorded in amounts "far more than we had any right to expect," said R. Cyril Gentry, director of Project Stormfury and of the National Hurricane Research Laboratory, Miami. Dr. Gentry said that minor changes were observed in the cloud structure and in the hurricane's behavior—changes of a type that could have occurred naturally—and that he would at that time decline from inferring any causal relationship. "It will take weeks of study to determine whether we had anything to do with the things that happened," he said.

The favorite theory of the hurricane seeders is that the precipitation induced in the eye-wall clouds by seeding will cause an alteration of the surface pressure in the eye—the central low-pressure region. This should cause the eye to expand, the theory runs, and since the boundary of the eye will now have a greater radius, the tangential winds at the boundary will not reach such speeds as they would otherwise.

Many meteorologists view this theory as naive. An article in the *Bulletin of the American Meteorological Society* (Vol. 50, pp. 216-246) by the staff of the RAND Corporation's Weather Modification Research Project comments that, at any rate, seeding is likely to do something, because hurricanes are sensitive to external conditions (they do not survive long on cool water or land) and appear to live by the release of energy when moisture is precipitated in cumulus clouds, which are known to be affected by seeding. The article goes on to point out that, since we can hardly hope to compare a seeded hurricane with an identical unseeded one, the only way of telling whether seeding has any effect is to predict how the storm would have behaved had it not been seeded. "And since today we cannot make the prediction, we cannot make the evaluation." But the time has now come to attempt a quantitative understanding of tropical storms; this understanding "can only come from close interaction between observational and theoretical, or simulation, work."

Max Edelstein, assigned to Stormfury from the Naval



The surface of a magnetic liquid in the presence of a vertical magnetic field.

Weather Service Command, sums it up: "We simply don't know enough about hurricanes to say what effect seeding has on a storm's activity."

Early in December the Secretary of Commerce, Maurice H. Stans, and the Navy Secretary, John H. Chafee, held a joint press conference in which they said that the maximum measured wind dropped from 98 to 68 knots (31 per cent down) after the first day of seeding, rose again on the day of rest, and dropped by 15 per cent after the second series of seeding runs. "We believe," they said, "that the force of Debbie was weakened by our seeding, since this occurred in accordance with our scientific understanding of how seeding would affect a hurricane." And they pledged their departments to even greater efforts in the future.

Will Magnetic Fluids Attract Business?

In spite of the headlong pace of technical change, it still takes a few years for a new branch of physics to really go commercial. The science of ferrohydrodynamics has been with us at least since 1964 (to judge by a bibliography on the subject issued by the AVCO Corporation, Lowell, Mass.) but the strange phenomena the field comprises are still awaiting buyers. Robert Kaiser, one of a team of ferrohydrodynamicists in AVCO's Applied Technology Division, gave a seminar in December to explain the nature and properties of magnetic liquids to M.I.T. metallurgy and materials science students.

A typical magnetic fluid looks like brown ink. It is a colloid of ferromagnetic particles—generally magnetite—in water, oil, or some other liquid. The particles are less than 150 angstroms across, and are coated with an agent that keeps them from clumping together.

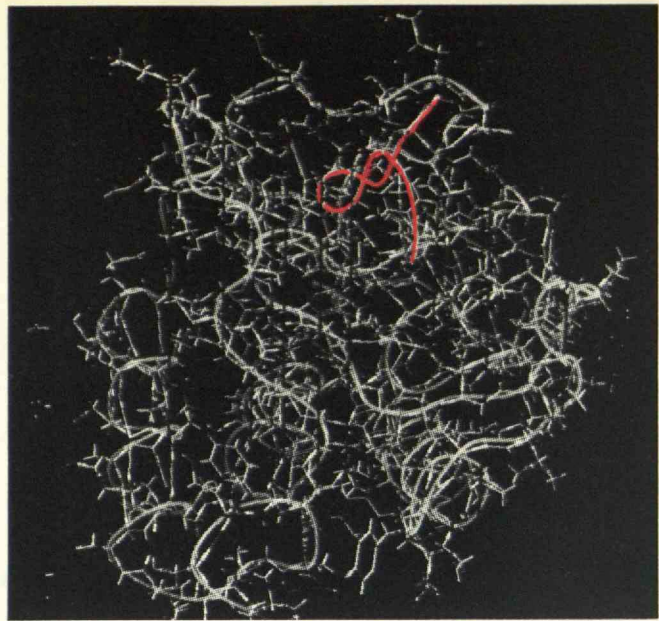
Structure of the nuclease enzyme of Staphylococcus aureus. The large curve traces out the chain of peptides which is the molecule's "backbone". The red twist represents an "inhibitor" molecule lying in the receptive cleft of the enzyme's active region.

A magnetic pull from above such a liquid will cause its surface to bulge; from below, to weigh heavier than its density would seem to warrant, so that a denser solid will float on it. Since this property gives it, in effect, a variable specific gravity, the principle could be used for measuring specific gravity—or for separating metal ores. If the mining companies took to this idea, magnetic fluids could be produced in large quantities and perhaps eventually cost only cents per gallon. (At present they cost around a dollar a cubic centimeter.)

A new kind of heat engine is possible. The fluid is attracted by a solenoid into a region where it is heated above its Curie point and thus rendered nonmagnetic (so that the solenoid does not retard its departure). Downstream is a heat exchanger which cools the liquid below its Curie point so that it can again be drawn into the solenoid. A turbine would extract in mechanical form some of the energy that started out as heat and electrical power.

The property of hanging suspended between the poles of a magnet offers a low-friction pressure seal for a rotating shaft. A magnetic-liquid seal can withstand a pressure difference of about an atmosphere. Conversely, a magnet floated in a magnetic liquid keeps away from the container walls; this seems to promise a type of bearing whose solid surfaces do not come into contact when at rest, removing the source of wear sometimes called "stiction." A floated magnet could also be the core of a simple inertial velocity meter. In a viscous magnetic fluid, movements due to acceleration accumulate to give a total displacement proportional to velocity.

An external magnetic field causes the particles in the fluid to interact magnetically, with the effect of increasing the fluid's viscosity. But any hopes of very widely variable viscosity now seem to be unjustified. According to Dr. Kaiser, who has studied this question in conjunction with the pioneer of ferrohydrodynamics, R. E. Rosensweig, magnetically induced viscosity changes are limited to a factor of four.



The Mechanics of an Enzyme

Its shape is roughly that of an apple, with a small bite missing. Look closer and you find that this globular object is really a single chain which describes spirals, accordion pleats, and randomly curving lines in three dimensions. What you see is one of the rarer phenomena in science, an accurate three-dimensional model, or tertiary structure, of a protein molecule. This is the eleventh mapped thus far, a nuclease produced by *Staphylococcus aureus*.

A six-year effort at deciphering the enzyme's structure by X-ray crystallography was recently completed by a six-man team at M.I.T. headed by F. Albert Cotton, Professor of Chemistry, and Edward E. Hazen, Jr., Research Associate.

There are several reasons for mapping the molecular structure of this particular enzyme. Dr. Cotton explains that, in general, enzymes are of special interest because they expedite all life processes: building new protein chains, tearing down old ones, and performing all of the functional chores a living system requires. "We want to decipher why an enzyme is an enzyme—why it has this fantastic power to speed up a reaction hundreds of times," he says.

Another reason for interest in enzymes is that they are proteins, and this nuclease provides us with a good model of a protein molecule. "Because it is large—a molecular weight well over 16,000—we can observe how a protein forms itself, how it knows what tertiary structure to adopt," he explains. "This enzyme is shaped solely by the sequence of its amino acids—there are no covalent bonds between them and no templates for production."

Dr. Cotton and Dr. Hazen worked in close cooperation

with a team headed by Dr. C. B. Anfinsen of the National Institutes of Health, in which was worked out the primary structure—the linear arrangement of amino acids in the protein chain; Drs. Cotton and Hazen mapped its three-dimensional folds, spirals, and curves.

Since the structure was solved by X-ray crystallography, sample crystals of the right size and quality were essential. A solvent was found which produced nucleic acid crystals uniform enough to yield a high-resolution picture of the structure. Structural features separated by as little as one and one half angstroms (a distance comparable to the separation of individual atoms) could be observed and recognized. Of the protein structures which have been solved thus far, only a few have been solved to this degree of resolution or detail.

Much of the spheroid-like structure consists of seemingly random curves. However, a considerable fraction consists of spirals, known as alpha helices, and of pleated sheets. The two ends of the chain protrude from the surface of the apple like the heads of worms. But the most interesting part is the enzymatically active region—the bite out of the apple.

"We are amazed at the neatness of the structure," Dr. Cotton says. "Each part of the molecule is in some way necessary as a scaffold for the active site—for the precise positioning of key residues and lock-in sites."

By observing how an "inhibitor" works on this site, Drs. Cotton and Hazen have also been able to infer a great deal about the way in which an enzyme takes hold of the "substrate" which it alters. (An inhibitor is a small molecule which cannot itself be operated on by the enzyme but which is strongly bound to it in a manner presumably similar to the way in which an enzyme binds a substrate). They have been able to pinpoint the specific amino acids which are critical in the functioning of the enzyme, and they have been able to see just how these groups cooperate in taking firm hold on inhibitors and substrates.

Dr. Cotton hopes to introduce larger inhibitors than he uses currently, until they approach the dimensions of real substrates. In this way he hopes to better understand how the enzyme actually binds and operates upon its true substrates. In addition, collaborative studies with Dr. Anfinsen are expected to yield very detailed information about the relationship between the three-dimensional structure of proteins and the information which is coded into the sequence of their constituent amino acids.

Laser Guidance for a Diffraction Grating

Diffraction gratings of up to 24 inches in length have been made possible by several technological developments under the direction of George R. Harrison, Emeritus Professor of Physics at M.I.T. Diffraction gratings work as prisms in the spectrographs now used in

astronomy, physics, and much industrial analysis; the largest that can be made without the refinements which Professor Harrison uses measure about 4 by 8 inches; larger gratings gather more light and yield more precise and informative spectra.

The gratings are produced by ruling engines in which a diamond stylus inscribes extremely precise parallel grooves across an aluminum-coated mirror. Commonly the mirror is advanced a tiny increment by a screw mechanism each time a new groove is cut. The first M.I.T. advance in ruling engines came in 1955, when an electronic wave signal and feedback system were devised to control the mirror and stylus movements. This first servo-controlled ruling engine could produce gratings of up to 10 inches long.

"The needed precision—to fractions of a millionth of an inch—is possible because of three separate controls on the movement of mirror and stylus," Professor Harrison explains. "The mirror moves continuously, so there is no friction jump each time a new groove is begun. Laser-interferometer systems on each side of the mirror maintain its speed and direction and assure that both sides advance identically. We have essentially a system in which a car must go straight even on a crooked track."

This produces lines accurate to within one millionth of an inch over several feet. As Dr. Harrison describes it: "If we imagine a grating to be enlarged ten million times, so as to span the continent, its grooves would lie at 100 foot intervals, equally spaced to within one foot or less, with no regular errors greater than one inch."

The two newer ruling engines, capable of making 18-inch and 24-inch gratings, use the same electronic control system. The changes are primarily in the supports used for the mirror and its carriage and for the engine itself. As the size of the mirror increases, its weight and that of its carriage increase greatly. The first mirror, 10 inches long, exerted a load of 10 to 15 pounds. The second, 18 inches long, provides a load of 50 pounds, and the third, 24 inches, a load of 500 pounds.

"If we used the support mechanism of the first engine, in which the carriage was rolled on balls, for heavier mirrors," Dr. Harrison says, "the friction would make smooth, precise ruling impossible." The second engine uses a special slider on top of a steel runway with a layer of very sticky oil between them. The oil adheres to the metal and acts as a layer of molecular bearings. This engine is now producing outstanding gratings. The third one, nearing completion, uses 120 quarter-inch rollers. The weight of the load flattens them to exactly the same size, ensuring a smooth ride.

At this degree of accuracy, steel is flexible enough to produce great deviations if even slightly jarred. "It behaves like rubber," is how Dr. Harrison puts it. So the second and third engines rest on 11-ton blocks of concrete which, in turn, are supported by three 16-inch steel cylinders with air pressure at 40 pounds per square inch.

Bacterial Cattle Feed From Garbage?

About two-thirds of the solid material in the average city dump, according to one study, consists of various forms of cellulose (about three pounds per person per day).

In nature, cellulose produced by plants is broken down by bacteria and thus re-enters the food cycle. W. Dexter Bellamy of the General Electric Research and Development Center, Schenectady, is studying selected strains of bacteria to see whether the same kind of process can be used, under human control, to convert garbage into protein-rich animal feedstuffs, thus lessening the threat presented by such innovations as the \$4 throw-away sleeping bag.

The bacteria concerned live at temperatures between 130° and 180° F., at which temperatures disease bacteria and viruses are killed off. This suggests one potential advantage for a bacterial disposal plant. A second point in favor of the cellulose-digesting organisms is that they need certain other nutrients, obtainable from sewage sludge, and might thus help to ease the water-pollution problem.

So far, Dr. Bellamy has studied 140 colonies of these bacteria and has isolated pure strains which "digest cellulose rapidly, reproduce quickly, and produce a 'biomass' containing a high percentage of protein." What remains is to find the best conditions for carrying out such fermentations, and to discover how to scale them up.

Of course, bacterial conversion of cellulose already occurs in the stomachs of ruminants, and Dr. Bellamy uses the rate achieved in this natural process—about ten grams per litre per hour—as a criterion for the economic feasibility of any artificial system. Presenting his results to the American Chemical Society in September, he reported some confidence that this goal could be reached.

Concrete From Glass

A proposal for using part of city trash collections as building material comes from Cedric W. Richards, a Stanford University civil engineering professor.

Up to 75 per cent of incinerated refuse from Washington, D.C., is glass and metal, according to the U.S. Bureau of Mines. Extrapolating from this figure, Professor Richards believes that nearly 15 million tons of the nation's annual trashpile may be composed of waste glass. The plan is to recover and purify glass powder from urban incineration for use as aggregate, to replace the sand in aerated concrete. (Aerated concrete is a "foamed" cemented mixture which can be formed into panels and short beams; it can be sawed and fastened much as wood paneling, has good thermal insulating and fireproof qualities, and is ideal for prefabricated construction, says Professor Richards.)



W. Dexter Bellamy of General Electric's Schenectady Research and Development Center uses an autoanalyzer to measure the amounts of protein produced from cellulose by his bacterial cultures. Can such conversion of waste into foodstuff become a route to reducing the growing glut of trash?

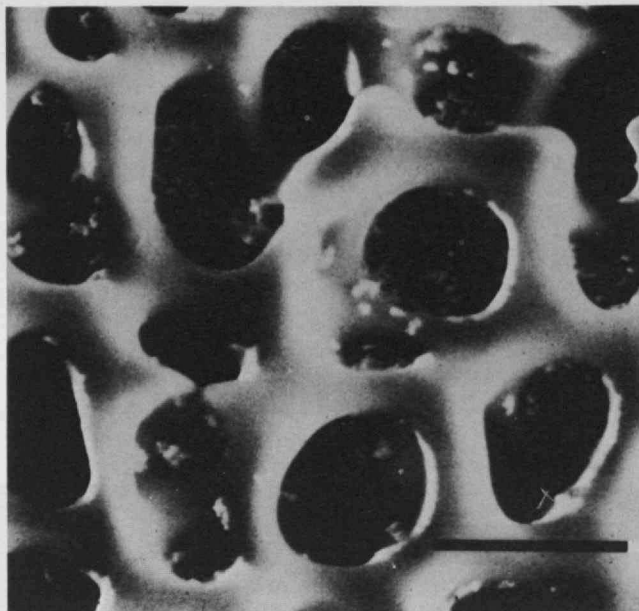
Professor Richards is now working on chemical and physical studies of waste glass powder to determine its usefulness under various conditions. Later he will undertake laboratory production of aerated concrete and test the result for its engineering qualities, and finally he will make an economic feasibility study.

David Wilson, Professor of Mechanical Engineering at M.I.T., points out that there is some precedent for research of this kind. Pulverized fuel ash is already used extensively in the U.S. as concrete aggregate, and incinerator ash is used in Europe for road building. But, Professor Wilson notes, most U.S. incinerators burn to an ash, so glass powder may not be available widely even if Professor Richards' process turns out to be technically and economically feasible.

Better Than Concrete From the Sea Urchin

The picture is a scanning-electron-microscope view of one of the "spines" of a sea urchin. This dome-shaped creature protects itself by being covered with these spikes, up to five inches long and steerable—gun-barrel fashion—with very little muscular effort. The material of which they are made is considerably stronger, on a weight basis, than limestone, from which it differs mainly in microstructure, or concrete.

The network structure is grown as a single crystal, reports Jon Weber of Pennsylvania State University (*Journal of Ultrastructure Research*, Vol. 26, pp. 355-366). The network is continuous from end to end. If the



Section of a spine of the sea urchin *Diadema setosum*. The scale line represents 20 microns. The entire spine is grown as a single crystal.

spine is broken it can be regrown; but it is difficult to break because a crack cannot proceed very far before it meets one of the holes.

Dr. Weber, who holds a joint appointment in the university's Department of Geochemistry and Geophysics and in its Materials Research Laboratory, collected the sea urchins himself from Pacific coral reefs. His co-authors are a geologist and three materials researchers. He considers that the natural world has lessons for the materials technologist but predicts that if we wish to make materials like that of the sea urchin's spines, the sorts of fabrication methods used for present structured materials are likely to prove inadequate; we shall probably have to learn to grow them.

Another Kind of Technology?

The view that a disproportionate share of our technology and technological manpower is devoted to military ends gives rise to the idea of "conversion"—conversion of, for example, defense laboratories into laboratories for the study of civilian problems. A seldom-heard view of the nature of technology was voiced at a seminar on "Technology and the Third World" during the conversion conference organized this winter by M.I.T.'s Science Action Coordinating Committee. It came from Professor Surindar Suri of the Friends World College, Westbury, N.Y.

Professor Suri considers that the advanced countries of the world—both Western and Soviet—have little hope

of converting from a military-based technology to a "technology of peace." Historically, our technology is rooted in warfare, he said, and its dehumanizing effects are the expression of an innate bias. The nations of the "third world," on the other hand, have the opportunity to make a fresh start—provided that they resist the temptation to try to apply the technology of the advanced nations to their own purposes.

This opportunity exists in countries such as India (Professor Suri is Indian) which have preserved to some extent the older values, standards, and customs—sometimes dismissed as archaic—that they had before the coming of Europeans. "India should be given some sort of medal," said Professor Suri, "for preserving its 'archaic' self. . . . Even I, a few years ago, would have thought of India as backward. Now, I say, thank God for underdevelopment!"

He would like the people of India and Africa to stop thinking of themselves as "underdeveloped"; for, after all, this category is a recent and exotic one which derives only from the notion that the "development" we now see in the U.S. and Europe is normal.

It is clear enough that people in the "third world" might improve their lives by developing new tools. But, as another speaker at the seminar pointed out, it is by no means clear that our planet could support its population for very long if everyone ceased being "underdeveloped" and began to consume resources as fast as Americans do.

The question remains as to what sort of technology might be developed, given a fresh start and the intention to adhere to traditional values rather than to adopt the modern Western goals which can be realized only through modern Western devices. For Professor Suri, a central distinction is to be made between "tools," which extend the individual man, and "machines," which expand society. (Whatever the reasons for it, mechanization is generally accompanied by a need for closer cooperation between people (*see next page*).

One Indian speaker recalled that Gandhi had made household spinning and weaving a symbol of liberation from external control, but that the textile industry which grew up at the same time undermined this movement. Another speaker quoted Joseph Needham, the Cambridge University historian of Chinese science, on the improvements made to the eighteenth-century European plough—an early advanced import—by rural blacksmiths. The idea emerged that when people see that they can work for their own direct benefit, their ingenuity can come into play with dramatic effect. But the materially efficient industry of the West exerts an influence which is hard to resist.

Possibly relevant to such a discussion is an irrigation pump now at the prototype stage at the Indian National Physical Laboratory, New Delhi. A solar reflector supplies heat to a Stirling-type hot-air engine (invented in 1816, as the September, 1969, *Science Today* report points out) to provide mechanical energy, with no external fuel or electricity supply, and no pollution.

The Universal Mechanized Farmer

Farmers are very much the same the whole world over—a United Nations project on “Social Implications of Mechanization in Agriculture”, which began in 1965 and whose results were reported last year, leads to this tentative conclusion. The social effects of the enlargement of the scale of farming, necessitated by the introduction of new machinery, were examined in Czechoslovakia, Denmark, Finland, West Germany, Italy, the Netherlands, Poland, Switzerland, the U.S. (Louisiana) and Yugoslavia.

A.K. Constandse, a Netherlands sociologist who has spent two recent years at Louisiana State University as visiting professor, was secretary of the project, and gives some preliminary findings in UNESCO's *International Social Science Journal* (Vol. 21, No. 2, a special issue on rural problems everywhere from the U.S. to India). Between the countries studied there are, of course, vast technological differences. If the importance of fitting rubber tires to horse wagons in Poland could be measured in psychological terms, says Constandse, “it would perhaps be as important as the introduction of aeroplanes for rice planting in Louisiana.” But some striking generalizations nevertheless emerge.

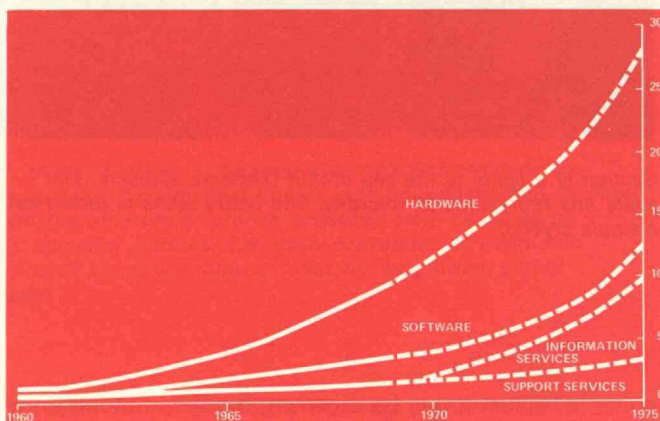
As the degree of mechanization rises, so does the size of farm required to use the machines effectively. In general, farms are not growing as fast as technical changes would warrant. The result is that mechanization is either retarded or, if effected, “leads to financial burdens which diminish income.” This is observed everywhere (including the U.S.) except Czechoslovakia, where nearly all the farming is done by cooperatives and where few of the generalizations hold. Mechanization without changing the farm structure raises problems which are often solved by product specialization.

An alternative, frequently chosen, is cooperation between farms in the use of machines or of (dwindling) labor. Oddly enough, the most expensive machines are least likely to be shared—the reason being that farmers do not trust each other with them. Cooperation is generally between only two or three farms, informal rather than written and done in such a way as to leave each partner as free as possible.

Asked to comment on the effects of mechanization, some American and Dutch farmers distinguish themselves from the rest by noting a *reduction* in their leisure time. These are men who find themselves having to do more field work as the labor force shrinks.

It seems that, while most farmers would like their operations to be somewhat larger, they do not envisage the sort of radical structural changes that would really adapt the farms to changing techniques. “Compared with the enormous changes one sees in industry and other sectors of the economy and the expectations of people in these fields, one must conclude that fundamental changes constitute an unfamiliar prospect for farmers, or one that is rejected.”

In 1960, ten years after the introduction of the first computer for commercial use and 15 years after the first electronic digital computers were installed at the University of Pennsylvania and Harvard, computers sales were \$1 billion. In 1969 it was a \$10 billion industry; and by 1975 the computer business will reach \$27 billion, according to the Diebold Group's new year's estimates.



Bull Computer Market

The penetration of computers into America's daily life has only just begun. By the end of 1969, 70,000 computers were installed and working in the U.S.; 18,000 will be added in 1970, and by 1975 annual shipments will be up to 46,000, the total in use to 160,000, the total computer industry sales over \$27 billion.

The largest factors in this bullish forecast are small, low-cost computers, peripheral and terminal equipment, computer software, and programmers, systems analysts, and operators, whose numbers will exceed 700,000 by 1975. The small computers will mark the substitution of “firmware” (built into special-purpose minicomputers) for “software” (elaborate programs for large, general-purpose computers) and on-the-job programmers.

These are the prognostications of the Diebold Group, Inc., a consulting firm devoted primarily to the impact of computers on management. Their forecast for their own special field is also bullish: today the aerospace industry spends 2.4 per cent of its sales on data processing; in the next five years everyone else will be catching up, investing in computers for design and engineering, procurement, production and manufacturing control, financial control and planning, and information services.

By 1975, says the Diebold forecast, on-line data collection for accounting purposes is planned in 80 per cent of America's large (sales over \$1 billion) industrial products corporations, 44 per cent of large consumer products corporations, 92 per cent of medium (above \$400

million) industrial products corporations, and 65 per cent of small (under \$400 million) corporations of both categories. By 1975 mathematical techniques will be used in marketing by at least 80 per cent of all corporations, and dynamic scheduling, computerized purchasing, and time-shared engineering and scientific systems will be used in over half.

"The most impressive development in the coming decade," says the Diebold Group report, "will be the growth of information services—on-line computation capability and sales and distribution of information through a communications network." Their estimate: from \$300 million in 1970 to \$6 billion in 1975.

All this growth, says the Diebold report, promises "a continuing chronic shortage of skilled data processing personnel" in the 1970's. Will it continue even if the U.S. drops into a recession? Yes, said John Diebold at the press conference for presentation of the forecasts, because the computer industry "is not yet stabilized in its relationship to gross national product."

Alaskan Oil: The Transport Costs

The latest estimate for the size of the Alaskan oil field is 50 billion barrels—about ten times the total extracted to date from east Texas, and about one-quarter of the known Middle Eastern reserves. Moreover, the Alaskan oil seems to be low in sulfur, a major pollutant from power stations. The difficulty lies in getting the oil from Alaska to the U.S. east coast.

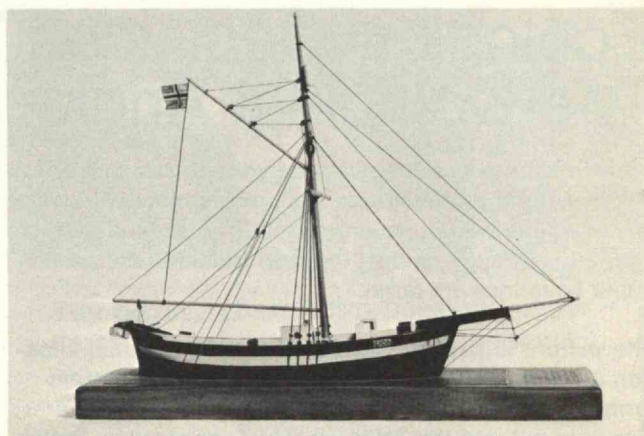
This transport problem was chosen by Professor W. W. Seifert, of the Civil and Electrical Engineering Departments, for the team graduate students who took his Interdisciplinary Systems Design course last year. The results of the study will be published as a book by the M.I.T. Press, but Joseph B. Lassiter, 3rd, gave the essence of the group's findings at a seminar in December.

Of the possible routes, some were written off fairly quickly. The sea route around Cape Horn would be extremely costly. A pipe line across Panama is not favored by the oil companies because of political uncertainties in that quarter. The Panama Canal is limited to ships of about 50,000 tons, whereas there is considerable economy in using much larger ships.

A north-south pipe line across Alaska, from the oil field to the easily navigable Pacific coast, is being built; one possibility is therefore a route consisting of the Alaska pipe line, a sea voyage down the Canadian coast, and a trans-U.S. pipe line. The team concluded that this would cost about 60 cents/barrel, this figure being the price of transportation alone. Submarines travelling the Northwest Passage, now proposed by General Dynamics, would cost \$1.20/barrel, the team calculated.

Bringing an anticipated million gallons a day through a Canadian pipeline would cost 65 cents/barrel. While this would provide a means to tap the resources of the

The Manhattan was not the first vessel to complete the long-sought Northwest Passage; that honor belongs to Gjøa, a converted Norwegian fishing vessel built in 1872 and refitted as a research ship (with a 13-h.p. kerosene-burning engine) by Roald Amundsen in 1903. Amundsen sailed from Oslo in Gjøa in June of that year, and he arrived in Nome, Alaska, on August 31, 1906, after a voyage of exploration during which the position of the North Magnetic Pole was charted for the first time. This model, displayed this fall in M.I.T.'s Hart Nautical Museum, is carved from the wood of Gjøa's mast.



Mackenzie Delta area, it would represent a \$6 billion outlay to begin with, and the group considered that the oil industry was unlikely to put out such an investment. An ice-breaking tanker fleet would cost just half as much to build, said Mr. Lassiter, a year-round average, and result in cost for transportation somewhere between 64 and 76 cents/barrel. It was assumed that, to be built in U.S. yards, the ships could not be bigger than 250,000 tons displacement. The experience of the *Manhattan* during its round trip last year indicates that, whereas a 250,000-ton tanker would ordinarily develop about 30,000 s.h.p., an ice-breaking version would need 100,000 s.h.p. Its cargo capacity would be only about 200,000 t., and it would cost \$54 million. Nor is it clear what the working life of such a ship would be.

Another major uncertainty is how fast the tanker could proceed through the ice. Professor Seifert's group believe that eight knots is a feasible average, but at two knots the transport cost would roughly triple.

If indeed the Northwest Passage proves to be the best solution technically and economically, as the study indicates, other difficulties remain. The idea of American tankers carrying large quantities of oil through the Canadian archipelago has aroused much opposition in the Canadian press and government, since a major oil spill in that area could be extremely serious. And there is one unsolved problem: besides being drier than the Libyan desert, often colder than the brittle transition temperature of normal steels, and obstructed with ice, the north coast of Alaska has an unusually shallow slope. It is not obvious how to load a big tanker. The cost of an Arctic harbor could be \$400 million.

Can "preference function" analyses of the costs and gains of a new dam help quantify the variables and make water resources decisions more rational? The lighter line shows a conventional analysis of the relationship between the increasing size of a dam and its economic value (the planner's "preference function"). The double line, showing the contractor's "preference function" (assuming his contract is funded), reveals his concern simply to achieve the maximum economic gain. But a conservationist's "preference function," shown by the heavy line, is very different, because at some point A on the scale of the dam's increasing size, it suddenly affects a unique ecological environment. Beyond that size, with the environment destroyed, the dam leaves the conservationist ambivalent once more.

Ecological Decisions: The Compleat Angler

A new dam will provide needed hydroelectric power and perhaps flood protection as well; but its pool will destroy a unique wildlife environment. The Isaak Walton League is arrayed against the dam builders and newspaper headlines are large.

The picture is familiar. It describes an emotional situation in which any decision on truly rational scientific terms is difficult if not impossible. A different vision was held out late this fall at an M.I.T. seminar by David C. Major, who as Assistant Professor of Civil Engineering is directing a student-faculty project involving the mathematics of "multiple-objective maximization" applied to water resources management.

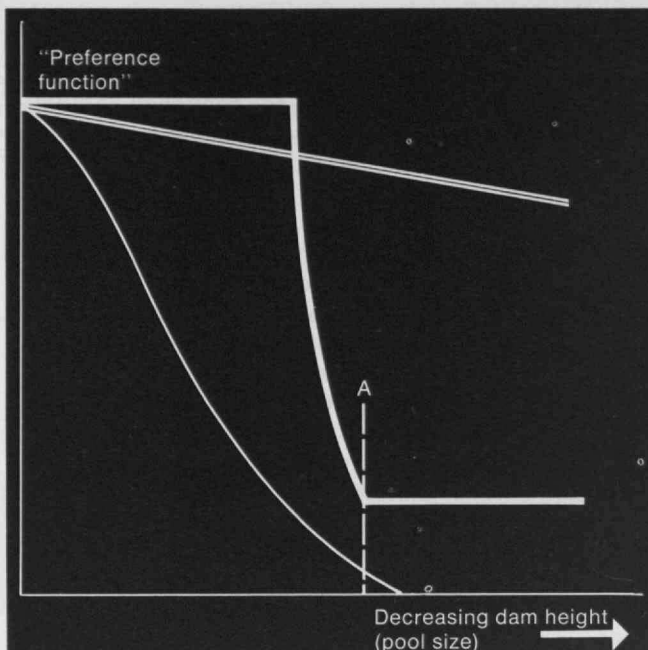
Analysis of a hydroelectric project in terms of its economic potential—plotting, for instance, the costs of a higher dam and larger pool of retained water against the economic gain which the dam will yield—is fairly routine. When he does this, the planner develops a relationship between dam height and economic gain (a "preference function") which proves essential to the final decision making.

The M.I.T. engineers now propose to superimpose "preference functions" which represent the values assigned to the project by various groups whose interests may conflict.

The dam builder, for instance—given a funded contract—has a nearly horizontal "preference function"; he cares little about how high the dam is, except as it affects performance in economic terms.

But the conservationist has a very different "preference function." At some critical point along the scale of increasing size, the proposed dam will destroy that unique environment which he is determined to save. Above that point it matters not how high is the dam; its damage has been done. Below that point, with the environment unaffected, the Isaak Walton League is ambivalent.

Given the conventional economic analysis and the ecologists' "preference function" plotted in parallel



terms (as shown in the sketch), says Professor Major, we can find the points where these two are closest, where the amount of ecological value to be sacrificed to economic good, and vice versa, are lowest. He is not so naive as to expect conservationists to accept any equality between a unique ecology and any economic indices, but he hopes that quantification may add a measure of rationality to a debate which has heretofore been almost entirely emotional.

Engineering the Heart

Three years ago, when the National Heart Institute of the National Institutes of Health began its systems development program, the medical people worried about finding materials that would be compatible with blood. Today there are available no less than five materials that will not cause clotting. They were developed not by physicians but by chemists, engineers, and other members of the science-engineering community, and they are another example of fruitful collaboration between technology and medicine.

Dr. Frank Hastings, Chief of the Institute's Artificial Heart Program, reported these developments at a fall colloquium during which participants witnessed, for the first time in history, heifers with implanted artificial hearts grazing in a field.

Dr. Hastings addressed an *ad hoc* advisory committee of engineers and physicians he had called together for evaluation of current progress and to plan future research. One was Joseph H. Keenan, Professor Emeritus of Mechanical Engineering at M.I.T., who is an associate of the Thermo Electron Engineering Corp. of Waltham, Mass. Energy sources for the mechanical hearts are either electrical or thermal, and Dr. Keenan is concerned particularly with the latter.

Each of the four young animals viewed by the panel of

experts had been implanted with an artificial heart system supplementing—and in series with—its own intact left ventricle. Two systems were powered electrically and thermally. Neither of the thermally powered systems was in actual operation at the time of the symposium, although each had operated for short periods after implantation. One electrical system could be operated either from externally rechargeable batteries or by electrical induction from an external source. A motion picture of the animals grazing showed them to be little troubled by two or three strands of wire, power and instrument leads, dangling from their flanks.

In one animal, an occlusion device had been inserted into the heart for demonstration purposes. When activated, the device precipitated a "heart attack," and movies showed the animal crumpling in its stall. When the supplemental heart went into action the animal was restored to apparent normalcy within 20 minutes.

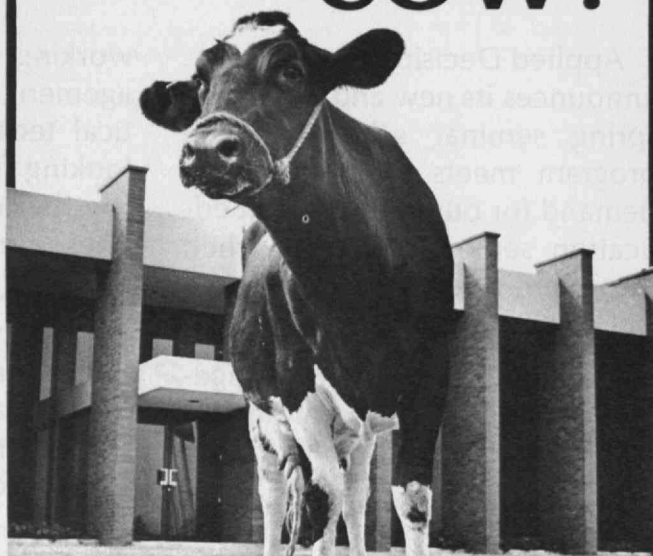
Dr. Lowell Harmison, who is Dr. Hastings' assistant, described the technical aspects of the implantation program—referred to on the agenda as the "saltatory" effort. Webster defines *saltatory* as "of or pertaining to dancing—hence characterized by saltation, making leaps and bounds—hence [by derivation] saltatory thinking." The technology was partly new and partly taken off the shelf, but the saltatory thrust came about when the artificial heart program brought together the loose pieces of technology and combined them to make the mechanical hearts now implanted in the heifers.

Toleration by the animals of various implants, for periods of a few weeks to several months, has been demonstrated. In one animal the artificial heart pump could be started and stopped at the will of the experimenter by means of electrical-induction signals transmitted across intact skin. Thus the animal's own heart could be relieved of the pumping task for a period of time by the artificial pump.

Much work remains to be done in the interfaces of physiology and technology before a miniaturized device will be ready for human implantation. A high degree of reliability of the total artificial heart system will be necessary. However, Dr. Harding explained, "the patient with a damaged heart has a sick heart. If the hardware outlasts the sick heart, we must consider whether total replacement may be more valuable than supplemental assistance."

In response, Professor Keenan observed that technology has now so advanced that the physiological reaction to the surfaces of the mechanism may be more decisive than the quality of the engineering involved. He said that we can eventually, and after sufficient effort, supply engineering of almost infinite reliability.—Clyde C. Hall

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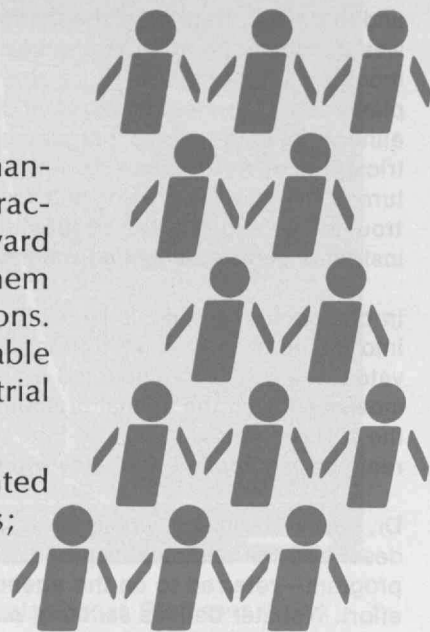
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Special Report

Four Months of Discipline: From Secrecy to Court

To understand the events of January, 1970, at M.I.T., when a group of radical students and others occupied the offices of the President and Chairman of the Corporation, readers of the *Review* must have some details of earlier disciplinary actions and of the operation of the Committee on Discipline.

Students have been informal participants in disciplinary decisions for ten years, and this fall their role was formalized when three undergraduates and two graduate students became members of the Committee on Discipline, which receives cases of "serious infractions" of community standards through the office of the Dean for Student Affairs. It can itself place students under "admonishment" or the more serious "disciplinary probation," and it can recommend to the President that a student be disqualified for disciplinary reasons. Students affected by Committee proceedings have traditionally been protected by privacy.

On October 9 the Committee reported to the faculty that five students had been placed under admonishment and one student, already on admonished status, placed on disciplinary probation after their part in disrupting a meeting of the 1969 Alumni Seminar.

On December 31 the Committee reported to the faculty on three additional decisions: one student among five charged with "active participation in a demonstration in which violence was present, which violated the rights of both individual members of the community and the Institute itself, and which disrupted a function of the Institute," a protest of General Electric Co. recruiters at the M.I.T. Placement Office on October 29, was placed on admonished status, and charges against one were dropped; two students found "to have verbally abused an Institute official and to have conducted (themselves) in a derisive and disorderly manner which contributed to a disruption of (a meeting of the Discipline Committee on December 17)" were placed on probation; and one student, already on admonished status and charged in connection with both epi-

On Politics, Discipline, and the Limits of Protest

Yesterday's academic discipline was simple: cheating on examinations, plagiarism, illegal dormitory guests, and corridor water fights all have a Victorian quaintness when viewed in an era when strongly held convictions about social issues motivate young people to acts which must be defined as anti-social. Michael A. Albert, former President of the M.I.T. Undergraduate Assembly, contends he was expelled from M.I.T. because of the political principles he advocated. But the Committee on Discipline replies unequivocally: Mr. Albert's actions in advocating his political position were in fact an intolerable threat to the university.

A face-down on the question has seemed inevitable at M.I.T. since mid-October, when the Committee on Discipline reported its action on complaints against six undergraduates involved in a disruption of the 1969 Alumni Seminar. The Committee then—and twice since then—refused to accept the radicals' contentions that the intransigence of M.I.T. toward their demands justified their increasingly coercive means. Finally R.L.-S.D.S. determined on the most direct attack yet made against the integrity of the M.I.T. community: after presenting an ultimatum of "non-negotiable demands" concerning recent disciplinary decisions, the radicals on January 15 broke down the door and began the 34-hour occupation of the President's and Chairman's offices which is chronicled in detail in the adjoining columns.

When the "live-in" began campus opinion was open to the proposition that Mr. Albert had in fact been the victim of a political, not a disciplinary, judgment. But M.I.T. as a whole was stunned and angered by the occupation of the offices, and the intruders emerged late Friday with neither their ultimatum fulfilled nor their cause strengthened. *The Tech*, the undergraduate student newspaper, called the occupation "the least constructive action this campus has seen in a long time. . . . The atmosphere has been poisoned and the prospects of reform have been dimmed."

While M.I.T. pressed charges against 20 members of the M.I.T. community and nine others who could be identified with the illegal acts of the "live-in" and of other episodes during the two-day period, Howard W. Johnson, President of the Institute, promised that work would proceed on "the continuing evolution of the judicial process." And Roy Lamson, Professor of Humanities who is Chairman of the Faculty Committee on Discipline, declared at a faculty meeting on January 21 that the Committee had not acted on "political" grounds. The students concerned, he said, "demonstrated contempt for the behavior norms of this or any other community" and "for reasonable limits of dissent and protest. Neither particular political persuasions of the defendants nor use of vernacular in itself influenced the Committee's decisions," he declared.

sodes, was recommended to be disqualified for disciplinary reasons.

Meanwhile, two separate faculty groups studying other disruptive acts at M.I.T. this fall expressed the frustration that many feel in trying to define and determine guilt in group violence. But one panel headed by Hartley Rogers, Jr., Professor of Mathematics, stated that when dissent occurs in a university, it must lead to "active examination of the issues that have been the subject of dissent (as well as to the possibility of) penalties for those who have violated the rights of others or the essential functions of the institution. . . . Such rights are violated by anyone who commits a violent act, by verbal threat or physical force, against a member of the community . . . or who forcibly interferes [by direct physical act or threat of violence] with the freedom of movement of any member of the community."

The following more detailed chronicle covers the events of January, 1970:

January 8

Thursday, a new M.I.T. student weekly, reveals that Howard W. Johnson, President of M.I.T., has accepted the recommendation of the Discipline Committee and that Michael A. Albert, President of the Undergraduate Assembly, is the student who has been disqualified.

There are scattered acts of vandalism around the Institute tonight. "Amnesty for Mike" appears on building walls; and an iron pipe bearing an undisclosed message is thrown through a window of President Johnson's home.

January 9

The Tech, the traditional student newspaper, says in its lead editorial today that "the manner in which the Discipline Committee handled the case of Mr. Albert represents a dangerous precedent and a threat to the rights of students in the process of disciplinary matters. . . . The events which are cited as cause for the Committee's recommendation strike us as being a cover for the real reason for the expulsion: Albert's activities in organizing the November Action Coalition."

Karen Wattel, a senior who is Vice-President of the Undergraduate Assembly, writes in today's *The Tech* that Mr. Albert's "expulsion upon grounds of disruption of the Discipline Committee proceedings is a farce."

And Mr. Albert himself writes in *The Tech*, "For those at M.I.T. who dislike my politics because it threatens their interests, be they actual or prospective, all I can say is tough shit. And for the hypocrites who pretend only to dislike style and tactics while living comfortably and quietly in the most violent and destructive country the world has ever known, it is your hypocrisy that will be responsible for a great many of the lives

that will be lost in coming years."

The Discipline Committee today holds an open hearing on another of the charges stemming from the November Actions. As the hearing begins, some 100 young people, having rallied and marched past the President's office, crowd into the room; the hearing is moved to larger quarters where there is persistent heckling; but despite rowdiness the hearing proceeds to completion. (The defendant, George N. Katsiaficas, a senior who has just resigned as Chairman of the Interfraternity Conference, is charged with "interference, through use of physical force, with the Campus Patrol in performance of its duties.")

January 13

By a wide margin, members of the Undergraduate Assembly tonight approve a resolution "demanding" that "Mike Albert be reinstated immediately without a retrial." Additional demands that all other "political punishments" be rescinded and that the Discipline Committee be dissolved are passed by a less decisive vote of 31 to 14 (one abstention). The preamble to the motions says, "The General Assembly finds it difficult to believe that the same charges made against Albert could have been successfully made against (another defendant). . . . Therefore, the General Assembly concludes that the expulsion of Mike Albert was an act of political repression." The Assembly directs its Judicial Task Force "to prepare recommendations for a system of justice."

January 14

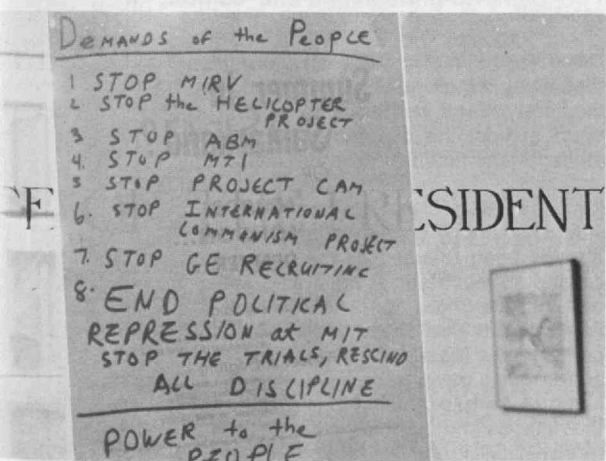
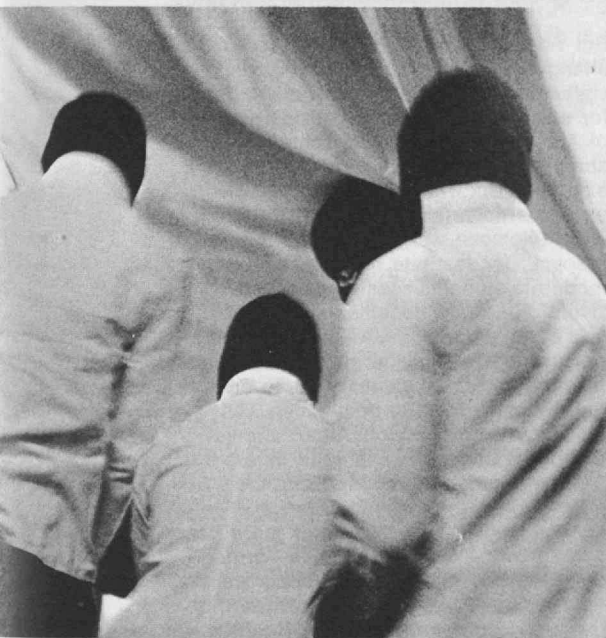
The President's office is today visited by a non-student seeking to deliver an ultimatum. He is refused. Some hours later, Jerome B. Wiesner, Provost, receives from a student—and promptly rejects—this ultimatum:

"As a step toward ending the political repression, we demand:
"1. Rescinding of all past discipline;
"2. Abolition of the Discipline Committee.
"Our demands must be met by 5 p.m. Wednesday, January 14. Otherwise we will provide new incentives to insure your cooperation in this matter."
The statement is signed by the New University Conference, the Rosa Luxembourg-S.D.S., and the Science Action Coordinating Committee.

Other students this noon pass out copies of the ultimatum, including a notice of an "incentive rally" set for 11:30 a.m. tomorrow. On the back is a long polemic signed by R.L.-S.D.S.: ". . . The Vietcong dared to rise up against the imperialist order of Nixon-Mitchell, Standard Oil, M.I.T., et al, and the response was and is a war of genocide. . . . The N.L.F. in Vietnam, the Black Panther Party, and you and I are fighting the same enemy—it is time for us to seize control of our lives and seize power from the man. He will put us down and defeat us, but we will win."

M.I.T.'s "January crisis" began on Thursday, January 8, when it was revealed that Michael A. Albert, President of the General Assembly, had been asked to withdraw from the Institute in consequence of his part in coercive acts during the fall; within 24 hours the campus had been the victim of several acts of vandalism. But the critical events began only on January 15 with a "guerilla theater" performance in the Rogers Lobby, followed by a march of students—equipped with miscellaneous paraphernalia for their threatened "live-in"—to the President's office corridor (bottom). With no warning—but obviously skillful tactical planning—four masked students materialized behind the crowd to batter in and push open the door to the President's private office; thus began the 34-hour occupation of the premises. Other "live-in's" threatened simultaneously for other parts of the campus failed to materialize. (Photos: Gary DeBardi, Harold Federow, and Richard King from *The Tech*)





January 15

The Discipline Committee this morning announces that Mr. Katsiaficas has been placed on admonished status following the January 9 open hearing and a later closed hearing.

The Science Action Coordinating Committee, M.I.T.'s graduate student radical group, this morning says "the expulsion of Mike Albert is an outrage and should be protested." But it says that S.A.C.C. was "incorrectly listed as a sponsor" of the ultimatum.

"There's an Open Door Down Here!"

The announced rally in the lobby of the Rogers Building this morning at 11:30 attracts some 100 participants and many more curious bystanders. A "guerilla theater" performance features two actors wrapped in cheesecloth and others moving around them waving signs, blowing and popping balloons, and shooting cap pistols. After brief speeches about the Albert case and defense research, the group at 12:15 moves toward the President's office.

The young people mill into the corridor, where a cluster of Campus Patrol, administration, and faculty are grouped before the main door to the President's suite. A "people's injunction" to prevent M.I.T. from "using force or violence" against "the people of the world" is read. Suddenly four men in white coats and blue ski masks appear carrying a battering ram of iron pipe, there are calls of "One, two, three!" down the hall, and a demonstrator announces, "Come on, everybody, there's an open door down here. We're in!" It is the seldom-used door to the President's inner office, from which there is access to a reception area and the office of the Chairman of the Corporation. The rooms have been vacated and the safe stands open and empty. At least 200 people enter the opened door—some 120 demonstrators followed by members of the Campus Patrol, administration, faculty, and observers. The masked men disappear.

Almost immediately J. Daniel Nyhart, Dean for Student Affairs, and Jerome B. Wiesner, Provost, order the intruders to leave and warn of disciplinary or court action against those who do not. There are pushing and shoving incidents between intruders, Institute officials, and news photographers.

Within 45 minutes the situation in the President's offices is stabilized: President Johnson's personal office has become a sort of neutral ground while the reception rooms and Dr. Killian's office have become an inner sanctum to which "guards" admit only those who pledge to support the intruders' demands.

"I Do Not Intend to Negotiate"

At a crowded special meeting this afternoon, President Johnson tells the faculty that "this attack on the Institute is of the greatest importance to all faculty and students. When you break down that

door," he declares, "you break down other doors. The group has moved away from the central issues on which we must stand—the advance of learning, the application of technology to the human purpose.

"I do not intend to negotiate on the basis of an ultimatum or on the basis of an occupation of an office," he says, "and I do not intend to provide room and board indefinitely."

Though there is some discussion of the need for changing disciplinary procedures and of a proposal to appoint special negotiators, it is apparent almost from the start that the faculty will give broad support to a motion by Raymond F. Baddour, Head of the Department of Chemical Engineering, to condemn the occupation of the President's offices and to urge civil and/or academic discipline against the trespassers.

During the discussion it is announced that the name of the New University Conference, an organization of radical faculty, appeared without authorization on the January 14 ultimatum.

By late in the evening the President's office corridor is quiet. It is estimated that some 50 intruders remain in the occupied rooms, from which "cleared" individuals come and go freely. There is music in the hallway, and a small group of students, administration, faculty, and Campus Patrol remain through the night.

January 16

"Come to Ho-Jo's"

This morning the intruders issue a new statement ("Come to Ho-Jo's") and add four new demands: an end to "imperialist research projects," no more General Electric recruiters on the campus, an end to M.I.T. "repression of workers," and a \$150,000 payment from M.I.T. to the Black Panthers. This morning access to the "inner sanctum" is granted to anyone who agrees not to testify against those inside.

At a morning press briefing, Paul E. Gray, Associate Provost, tells news media that "M.I.T. has not engaged and does not intend to engage in negotiations with those inside. . . . We are not going to consider these demands at the point of a gun." He says that the use of police and/or a court injunction against the intruders are "under consideration; but no decision has been made."

Thursday this morning prints three letters from the files of the President which it says were "received anonymously at our office sometime last night." In the same issue, Kevin George, Editor, says the atmosphere inside the President's offices is "very relaxed. . . . A brotherly/sisterly mood of optimism prevails. . . . Few people wish to stay in over the week-end. . . . They hesitate to call it a 'liberated zone,' particularly since it will be returned soon."

The Process of "Dehumanization"

Nearly 1000 students and faculty attend a Kresge Auditorium meeting this noon called by three undergraduates to discuss the "live-in" and the issues surrounding it. There are speeches from R.L.-S.D.S. members, sympathizers, and others; and there is a straw vote: some 20 in the audience say aye: "How many think that Mike Albert was really expelled for the reasons the Discipline Committee named?" But perhaps 200 say nay—there were other, unstated reasons. Near the close of the meeting, when its numbers are fewer, Dr. Benson R. Snyder, Dean for Institute Relations, calls attention to the "dehumanization" caused by an event such as the occupation. "It is profoundly dangerous," he says, "when people begin to make assumptions about what goes on in other people's heads without really trying to understand."

Two efforts are made this afternoon to disrupt Institute classes by demonstrators intent on discussion of the occupation; both are refused an audience. In one case, Dr. Edwin D. Bransome, Jr., Associate Professor of Endocrinology and Metabolism, personally escorts the intruders out of the classroom; in the other, John Wulff, Emeritus Professor of Metallurgy, is assisted in doing so.

"They Left With Nothing"

At 9:59 tonight, after an afternoon filled with rumors of forthcoming police action and evidence of continuing debate in the occupied rooms, some 60 intruders depart the President's offices with their various possessions, their chanted revolutionary slogans echoing drearily through the empty corridors. The offices are immediately sealed by the Campus Patrol and Institute officials.

Ten minutes later Professor Gray meets with newsmen to describe the President's offices as a "shambles." He reads a statement in which President Johnson says the students left the offices "because M.I.T.'s faculty and students refused to support threats and violence as a way to accomplish change in this institution." The intruders, says President Johnson, "went in with an ultimatum of non-negotiable demands. They left with nothing."

Upon departing from the offices, the intruders cross into the Student Center, where they join a radical meeting proposing "indictments" of the U.S. "for murder, racism, oppression, genocide, and rape of the earth." Two hours later, a group of about 100 young people leave the Student Center to make noisy demonstrations in front of the President's office, the President's House and several M.I.T. dormitories. In front of the President's House, one demonstrator climbs up to a first-floor window and kicks in the face of one of the Campus Patrol members attempting to remove him.

January 17

President Johnson announces this afternoon that the Institute obtained a court

injunction late yesterday and was preparing to serve the court's order on the intruders had they not departed last night. The order remains in effect.

"Reasonableness and responsible concern for the unity and future of the M.I.T. community required us, in this instance, to solve our problems—if possible—without bringing police on the campus," Mr. Johnson says. But, he continues, "the Institute could not pay the even higher cost of successful coercion by a group that had rammed its way through the door of the President's office."

"Throughout the 34-hour crisis," says President Johnson, "we were in constant communication with individuals and groups of faculty and students on the problems and the procedures to be used. The education process continued unabated except in the small area occupied by the intruders."

January 18

President Johnson writes today to M.I.T. alumni that "the Institute intends to bring legal charges against those who can be identified as participants in the action, whether they are members of this community or not. This action does not exclude internal judicial proceedings."

... Events like those of last week not only delay and disrupt but seriously set back the process of progressive change. We intend to deal with these incidents decisively so that we can go forward with the serious business of this institution."

January 19

Marvin Keshner, an M.I.T. junior, writes today in a letter to *Thursday*, "Because actions like the recent occupation of the President's offices always prevent real consideration of the issues, they are more than annoying; they are criminal."

January 22

A total of 56 complaints against 29 persons involved in events at M.I.T. on January 15 and 16 are issued today by the Third District Court of Eastern Middlesex. These include trespass charges against two members of the instructing staff, two members of the research staff, 13 students, three former students, and nine people not connected with M.I.T.; charges on the disruption of classes against one student and one former student; and charges of assault and battery on a member of the M.I.T. Campus Patrol against one student.

February 9

M.I.T. is informed today that a grand jury indictment has been returned against a member of the junior class "for participation in the manufacture of the instrument allegedly used on January 15 to break open a door" to the President's offices.

On the Changing Rates of Change

A partial explanation of some of the apparently strange and sudden events which occur today on college campuses rests with the fact that in a small, fluid college community moods and attitudes can change very, very fast. At M.I.T., for example, the same internal communications—student press, official and unofficial pamphlets, word of mouth from key administrators—are used by all. The word here travels fast, and the feedback travels even faster.

Moods can shift in big, slow ways; an example is the student body's progressive disillusion with the radicals over the last year. Last spring, when the newly elected, unknown Undergraduate Association President, Michael A. Albert, gave a first, brilliantly reasoned talk to the faculty, he suddenly became an object of curiosity and admiration. However, the Albert who stood outside the Instrumentation Laboratory building that rainy November morning—while 200 police in riot gear prepared to disperse his small army of demonstrators—was a different man. Many of the students who supported him in the spring of his term, by November ignored or rejected him.

But when events reach crisis proportions, changes can happen very fast. A key shift during the most recent events here, for example, was the galvanizing effect of Albert's expulsion from school on the student body. His expulsion was fully expected; but when among the reasons were "participation in a demonstration in which violence was present" and "disrespect" for Institute officials, many moderate students seemed outraged. Overnight, Albert became, once more, a part of the community. Another key shift became obvious at the general student meeting on Friday, January 16, to discuss the radicals' ongoing occupation. But there was no discussion: Albert and several of the occupiers appeared before the 1,000 students and monopolized the microphones in asking for support. The "uncommitted" students—now more concerned with final examinations—drifted out. Two hours later, the radicals were nearly alone, talking to each other. In this short time, any chances of general student support for the occupation vanished.

Discouraged, the radicals left the offices that night. When M.I.T. announced immediately that it would file complaints in court against the occupiers, many—both students and faculty—gave full support.

It must seem odd that the formal expulsion of someone whose tactics had already been rejected by the community caused so much stir. It must also seem odd that the "hard line" was so questioned in the Albert case and so supported in the legal action. Ideas are supposed to travel freely on a college campus. Perhaps it must follow, then, that images and opinions will also shift freely—D.S.

S.O.S. for Technical Education

Having attempted for four years to put Rindge Technical Institute (R.T.I.), a Cambridge project in technical training for high school graduates, into action, Robert Sweeney is baffled. Last fall's enrollment of new students into the electronics technician training program was zero. Enrollment in the second year training was only eight, and the second program in medical records training, also enrolled eight; but it is the zero which has Mr. Sweeney baffled.

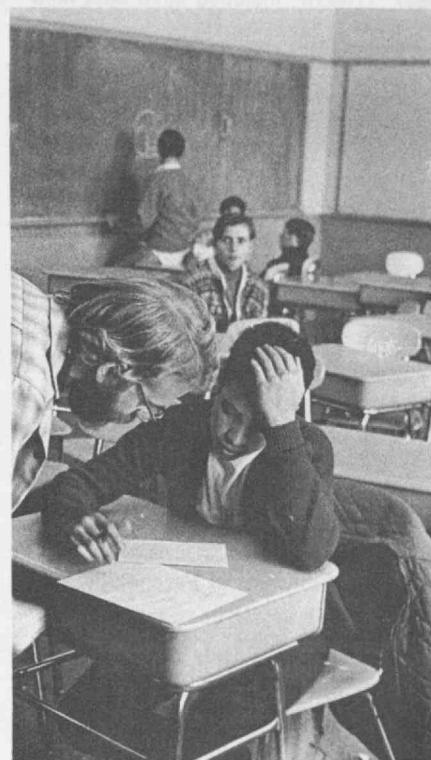
Sweeney is the Principal of Rindge Technical High School, one of Cambridge's principal high schools. He is also director of R.T.I., which has been his own charge ever since he decided four years ago that the city needed a post-high-school, tuition-free training program which would help a certain kind of student into a good job.

There is a shortage of workers in the medical records departments of nearly every hospital in Boston, so Mr. Sweeney arranged to coordinate study at R.T.I. with work in the field of medical information with the Children's Medical Center in Boston. Similarly, the vast number of electronics industries in the Boston area need electronic technicians, so Mr. Sweeney arranged for R.T.I. electronics students to work in N.A.S.A., Polaroid, and other Cambridge industries during their study in the two-year program.

But, although the medical records program has had steady, but sluggish, popularity, the electronics training program appears to be in trouble. The point is, as Mr. Sweeney says, that R.T.I. is issuing an S.O.S. for technical education at an often-overlooked level. Rindge Tech, like many schools across the country, is not equipped to send many students to M.I.T. or Caltech. Rather, the top quarter of the class will apply to accredited technical schools such as Boston's Wentworth Institute. But the question is, How do you educate the other three-quarters to find a job in an increasingly electronics- and engineering-oriented job market?

R.T.I. is trapped between the low academic interest and its need for academic excellence to keep employers interested. For example, the mathematics and physics requirements for the electronics program can discourage many students, but both are absolutely necessary to work for firms like N.A.S.A. and Polaroid.

Does one of R.T.I.'s troubles lie in its curriculum? Formerly, all the teachers in the electronics section were drawn from M.I.T. graduate students who keep up high standards—but only at the expense of an appalling drop-out rate. A possible explanation comes from N.A.S.A. staff specialist George Isenberg, who has worked with R.T.I. students and helped recruit: "The kids look at R.T.I. as a place to go if you don't get into a better place. It's too much like high school to them; it's even in a high school building. Consequently it feels like a half-step up, not a full one,"



Joel Zimmerman, a teacher, is now helping Cambridge high school students take extra courses in mathematics at the Rindge Technical Institute, a publicly supported school for grades 13 and 14 which trains local youth for jobs in electronics and in medical records. But this year the program is meeting with troubles.

A major proposal to advance computer modeling techniques in the social sciences, the Cambridge Project (*see right*) has come under criticism since it was first discussed at Harvard and M.I.T. last spring. Mostly, the criticism has taken the form of peaceful pamphletting and debate, however some has been more forceful, such as the list of demands presented by 175 S.D.S.-led students to Harvard's Dean Franklin L. Ford last spring.

Initially the criticism focussed on a list of projects in the original proposal which were "examples of research . . . of the kind likely to be carried out in the first year." The list included such data files as stability and instability conditions in less developed nations, document collections on communism which could "be integrated into any document system concerning Vietnam," and information on "world communist and radical movements."

Although the list was merely tentative, critics argued that the data would be biased toward American foreign policy concerns; thus it would inevitably be drawn upon by the Department of Defense, the project's sponsor, to (in the words of one pamphlet) "make Washington's international policemen more effective."

However, since the project's inception, only one of the "controversial" proposals has been considered for formal inclusion, says Project CAM's Advisory Board chairman, Edward Newman, Professor of Psychology at Harvard.

Another spectre quickly raised by critics was that the Cambridge Project would serve as the base for a vast data bank on individuals and social political and economic groups. However, subsequent policy decisions by the Advisory Board, says Professor Newman, have served to reassure critics by adding safeguards.

However, there remain two criticisms put forth by Jerome Y. Lettvin, Professor in the Departments of Biology and of Electrical Engineering at M.I.T.

1. Social science, which attempts to understand people, is different from social engineering, which attempts to determine how to control people, he says. M.I.T.'s social science is already weighted too heavily toward social engineering, and a new million-dollar project in this area will only increase this imbalance.

2. The issues posed by social engineering, like those in genetics, deserve close, careful examination. For, finding ways to control people is "in violation of the Jeffersonian spirit of free will in which this country was founded," he concludes.

Project Cambridge

Project Cambridge, a joint project to advance computerized modeling for the social sciences, was strongly attacked by "activists" at both M.I.T. and Harvard last spring and this fall—and very seriously questioned by a much larger number of students and faculty at the two institutions under whose aegis Project CAM was proposed to operate. The debate centered on the problem of balancing the values of new knowledge against the dangers of its possible misuse.

Now M.I.T. is formally participating, although Harvard withdrew last month. The Advanced Research Projects Agency of the Department of Defense will fund the Project \$7.5 million over five years.

The premise of Project CAM is that computer science, in particular the ability to model complex relationships among data, has so advanced that computers will soon be capable of representing the complex behavior of populations, political groups, mass communications, and social groups. Moreover, the social and behavioral sciences themselves have accumulated massive amounts of data which are badly in need of compilation. Hence the proposal is both feasible and needed.

The main thrust of Project CAM will be devoted to developing tools, not specifically to solving problems. The Project's Joint Advisory Board recently said that CAM's purpose "is to develop, test, and disseminate computer-related methodologies that will advance the behavioral sciences—not to apply the methods to particular problems of practical interest." And the Board noted that it must also be responsible "to insure that research on the control and ecological consequences of large information systems will be undertaken."

However, methods must be tested, and so it is likely that some of CAM's time and money will go to work on existing data, including such controversial files as simulations of mass communications in both developed and undeveloped countries, the "social and psychological bases of attitudinal change" in new nations, world communist and peasant movements, and text manipulation based on psychological interviews. It is these specific activities—and particularly their relationship to the Department of Defense through CAM's funding—which has attracted concern and criticism.

Two key policy decisions of Project CAM are that it will operate on "the accepted principles of open publication, respect for individual privacy, and nondiscriminatory access by the scientific community which govern all normal university research"; and that none of the work it supports "will be subject to military or proprietary secrecy."



Teller Doesn't Roll His "R's"

The play "In the Matter of J. Robert Oppenheimer" which recreates the security hearings of the Atomic Energy Commission in the spring of 1954, noted Davis H. Frisch, M.I.T. Professor of Physics, is built around "a profound question in the relation of science and government: Can an honest man direct a scientific undertaking in which he doesn't really believe?"

But that is the wrong question for today, replied Victor F. Weisskopf, Head of the M.I.T. Department of Physics, during a seminar at M.I.T. last fall, which included the cast, students, and several of Oppenheimer's former colleagues. "Our first and prime duty now is to convince the government that there cannot be a question on which the government is on one side, mankind on the other."

"In the Matter of J. Robert Oppenheimer," produced by the Repertory Theater of Lincoln Center, was conceived as "a great moral fulfillment" said Paul Sparer, who plays Dr. Oppenheimer. Albert G. Hill, Professor of Physics at M.I.T. who was a witness at the actual security proceedings, told the cast that "the sense of that room achieved by this group of actors is more accurate than they know." He sat in the wings during one Boston performance, he said, and only then did he realize "how much these actors lived their parts. I began living this affair all over again," he said, "... being back in that damned room."

Though Boston audiences (and the M.I.T. seminar audience, too) made him the villain of the piece, Frederick Rolf, who plays Edward Teller, said that in some cities he is the hero. He said he tries to convey that "one of the big dangers we run today is to dismiss the Tellers of this world." Dr. Teller doesn't see himself as a villain, said Mr. Rolf, and hence Mr. Rolf's question at M.I.T., "Do you find Dr. Teller in the play an understandable character?"

Was Dr. Oppenheimer really as unmoved by the hearings as he appears in the play? The play—and history—make clear what Dr. Oppenheimer saw then, and what few of his colleagues saw in the heat of the battle. Mr. Sparer paraphrased it this way: Let the A.E.C.'s Personnel Security Board take its action; it is predestined by the temper of the times; I cannot prove their error to them; they cannot know. "I was angry then," said Dr. Jerrold R. Zacharias, M.I.T. Professor of Physics, "but now I think I understand."

A member of the audience asked: "Were Dr. Teller's attempts to penetrate Dr. Oppenheimer's apathy in the script?" Mr. Rolf's answer: "None of the human relationships was in the script; we had to work these out ourselves." Did they succeed? Professor Weisskopf told Mr. Rolf at M.I.T.: "You have portrayed Dr. Teller exactly—even his sense of guilt, his wishing to have Robert's (Dr. Oppenheimer's) approval." "But," he noted, "Edward Teller doesn't roll his 'r's'."



The past has been recreated in a Lincoln Center Repertory Theater production of "In the Matter of J. Robert Oppenheimer," a play based on the 1954 Atomic Energy Commission security hearings of the noted physicist and "father of the atomic bomb." As a result of the hearings, his security clearance was revoked and his public life effectively foreshortened. At M.I.T. this winter, the cast of the play met with some of Dr. Oppenheimer's former colleagues (above left) to compare notes. Above is actor Paul Sparer as Dr. Oppenheimer in the play.

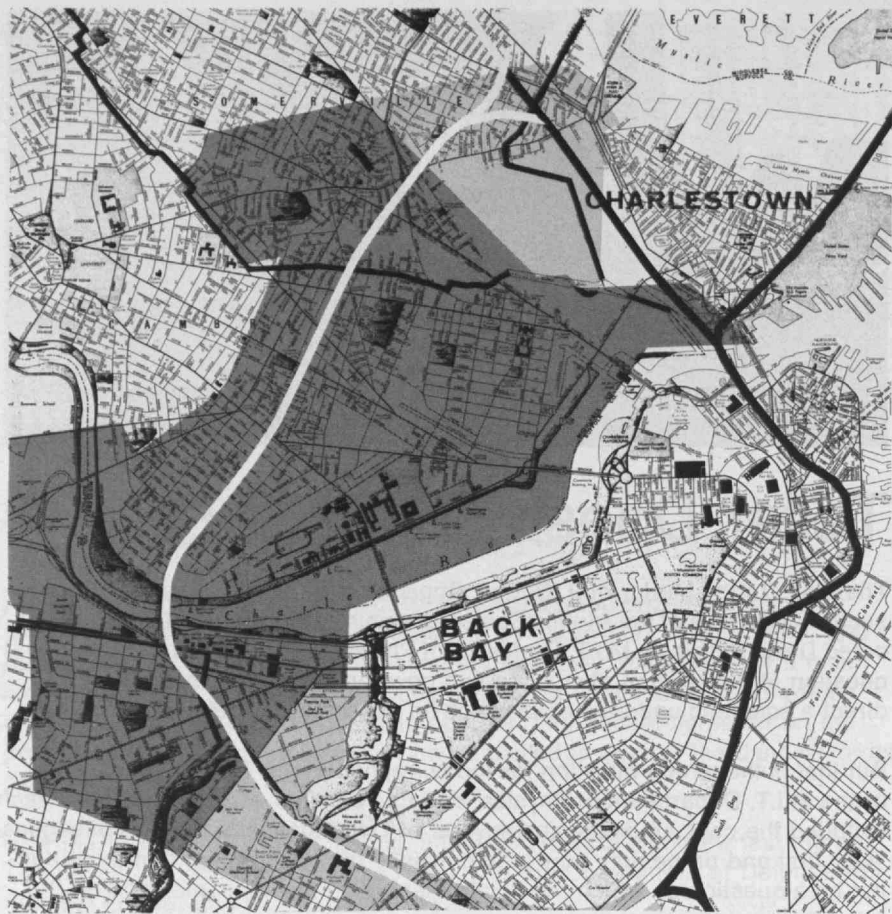
A Multi-Field Approach

The proposed re-study of the controversial Inner Belt expressway planned for Boston, Cambridge, Somerville, and Brookline (see right) will be a "joint-concept" study; that is, it will consider the Belt and the issues it raises from many different vantage points.

This is an approach, Belt planners say, which has been tried in Baltimore and in Chicago with some success; they think it may be the only way to resolve tough questions which have arisen over the routing of the road through Cambridge.

The experts from different disciplines will be divided into five groups; each group will make its own study and propose a Belt route and design for the needs and interests of the field it represents. They are:

1. Architecture and the Urban Environment. This group will study the urban landscape and the quality of the environment and decide the resulting priorities for a road.
2. Socio-Economic Approach. Urban sociologists and specialists in relocation will devise a Belt route creating best community conditions at least socio-economic cost. The group will coordinate with the Cambridge Model Cities project and, possibly, be most responsible for including the interests of local residents, especially those opposed to the original Brookline-Elm Street route in Cambridge.
3. Maximum Economic Development. Land-use economists and urban planners will develop a route giving most economic benefit to communities and the whole region. This will coordinate with an overall study of the economic base of the Boston region.
4. Engineering and Transportation. Highway engineers will review existing plans for the Belt in terms of highway design and suggest a route.
5. Transportation Planning. Traffic engineers will study the transport needs and plans of individual communities to develop a route most complementary to those conditions.



Not With Concrete Alone...

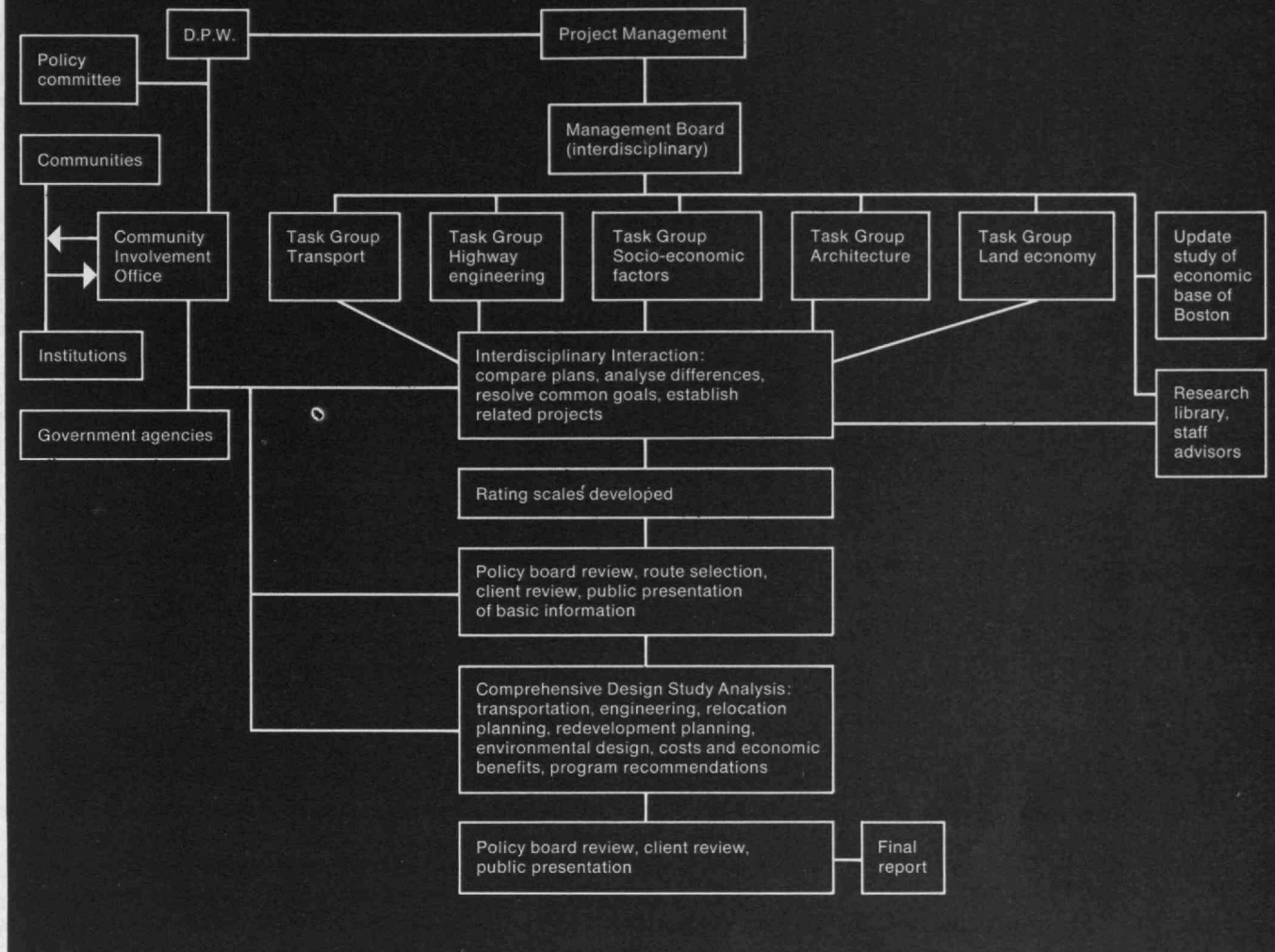
It takes more than a surveyors' team and concrete to build a road nowadays, especially if the road is an urban expressway. And the big new ingredient is community participation in the planning process.

This is the assumption of a new proposal to plan Boston's celebrated Inner Belt, the final in-town link in the regional highway system. Because of intense opposition particularly to the Cambridge link (the road was first proposed in 1948), the Inner Belt has become something of a national *cause célèbre*.

To resolve the Belt quagmire, the proposed restudy has a completely new cast: it will be a joint-concept study made up of teams from different disciplines working semi-independently (see left); and it will give everyone within a mile of the possible route—including Belt opponents—a voice in planning the final route.

The \$5 million restudy proposal has been made to the Massachusetts Department of Public Works, which has charge of the road, by Frederick R. Harris, Inc. of New York, in response to an order from the U.S. Department of Transportation. In a 1968 memorandum to D.P.W., D.O.T. ordered two studies: Task A, to restudy the transport needs of the Boston area to verify the need for an intown Belt; and Task B, to restudy the Cambridge link of the Belt, where opposition is greatest.

The proposed Harris (Task B) study, as requested in the memorandum, assumes that the Belt should be built, but not necessarily along the much-disputed 1965 route through Cambridge. The Harris proposal is now on the desk of "Mr. Inner Belt" at D.P.W., Leon F. DeMarsh, Assistant Chief Engineer, who says there is "every chance" it will be submitted to the Federal Bureau of Public Roads for approval very soon.



Opponents of the Belt have favored the restudy order because it will further delay construction and because they believe the whole question of the Belt in Cambridge deserves re-examination.

In the proposal, regard for community interests takes several forms. First, residents will be able to swap evidence and conclusions with planners at a number of "Community Involvement Centers" set up in local communities.

Second, one of the five groups of the Design Team preparing separate Belt routes will specialize in how to maximize community welfare; this group will deal with questions of housing, relocation, and social benefits.

Third, the proposal outlines a wide piece of land—nearly half of Cambridge—for route and design consideration by all five groups.

Finally, the general tone of the proposal urges the team to give weight to local interest. In a preliminary version, E. H. Harlow, Senior Vice-President of Harris, wrote, for example, that "a sound plan for the relocation of homes" is of "utmost importance." He said the study should "develop a concept for a modern express highway that will take into consideration its full effect on the urban environment and recognize its impact on social, economic, and cultural aspects of the community."

He also wrote that he hopes the plan will become a model of an alternative to the traditional "public hearing" process, where, too often, citizens are presented with a single solution and can exercise only a negative voice.

The Inner Belt quagmire, which has become nationally known as a classic case of highway builder versus local resident, may finally get a face-lift in a new, proposed restudy. The study will include a wide area of city land, as shown in the map (above, left) to consider thoroughly all possible effects of a given route. The chart (above) shows how the restudy will try to resolve conflicts between the local communities and the urgent need for a road: groups will be able to present their cases to independent task groups and through the Community Involvement Office, which is linked to policy makers, the task groups, and local institutions.

Some 70 per cent of M.I.T. undergraduates who took the trouble to vote in a recent referendum believe M.I.T.'s commitment to perfect the M.I.R.V. warheads is wrong. Where did they learn about M.I.R.V.? Why do they object to it?

Techmen: Traditional and Untraditional

The scene is midmorning: dozens of students are hustling through the corridors, books in hand, to the clang of the fire-drill-like bell which announces the breaks in class periods in the M.I.T. main corridors. At a particularly busy junction in the hallways, other students hand out the now-daily leaflets to all and sundry: "Meet there . . .," "Join this . . .," "Read that . . ."

A normal day on any campus having corridors, books, and bells? Yes. But this scene was also repeated during the eventful days at M.I.T. in early November when several hundred demonstrators protested M.I.T.'s role in defense-related research (see *Technology Review* for December, 1969, pp. 96A ff).

The national press coverage of those events brought out the fact that only 20 per cent of those demonstrating were bona fide students; it was also publicized that throughout the crisis classes continued normally.

What do these facts mean? Do science and engineering students form a "great silent majority" who are in fact uninvolved with these crisis-laden issues? By carrying on normally were they staging a counterprotest?

Attempting to answer these questions, *Technology Review* found a student consultant (see right) to look at the campus mood. It also conducted an informal poll among the so-called silent majority. Concurrently, the M.I.T. student government conducted a referendum of student sentiment on the controversial question of M.I.T.'s commitment to the multiple independently targeted re-entry vehicle, or M.I.R.V. However faulty, the results say something about the M.I.T. undergraduate, future alumnus, and future engineer and scientist.

◇ Significantly, a resounding 72.4 per cent of the undergraduates voting in the referendum (35.2 per cent of all undergraduates) oppose the Institute's commitment to M.I.R.V. The *Review's* random sample revealed that a majority favored "a better mix" of war to non-war-related research at M.I.T.

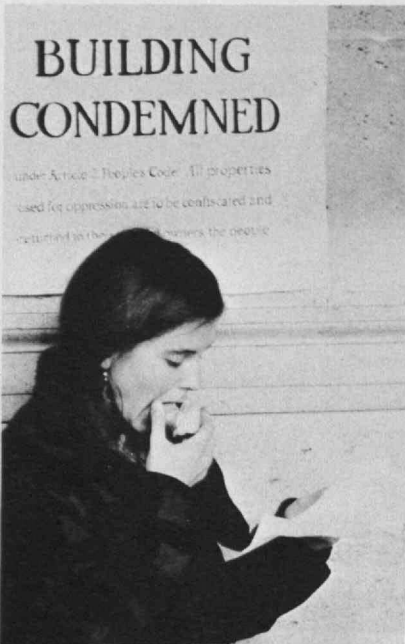
◇ The "business-as-usual" picture of the Institute was deceptive; more than half the students polled had observed at least some part of the November demonstrations; only 40 per cent of those polled remained wholly absent.

◇ Similarly, two-thirds of those reached in the sample stated that they had discussed M.I.R.V. and the other issues "more" since the November demonstrations and early fall. Half mentioned the student press and campus leafleting as their main sources of information. Finally, two-thirds claimed that the demonstrations "did not change" their views on the issues.

◇ Support for President Howard W. Johnson's handling of the crisis was general among the students. But two-thirds said they felt the demonstrators should not be punished.

In other words, the M.I.T. student body—with whatever implications this has for science and engineering students elsewhere—although officially "silent," is far from ignorant. They may not have said much, but they have read and observed a great deal; all those polled were definite and anything but silent on their views. Although it is well known that the demonstrators had little actual support on campus, sympathy with the issues is widespread.

These positions paint a different view of the M.I.T. student than have stereotype, image, and tradition. All this suggests that the traditional "Techman," immersed in his courses and laboratory and actively disinterested in social questions which do not yield to quantitative methods, has changed. He has not deserted his lab by any means, but he has added to it other concerns.



Students: A Student View of Activism and Its Sources

by Bruce Schwartz

The following commentary was written for Technology Review by Bruce Schwartz, a sophomore at M.I.T. from Camden, N.J., who is working as a student reporter and columnist for one of the student newspapers, The Tech.

I write this in 1969, but you are reading it in 1970. Perhaps you are tired of reading postmortems on the decade just died, but here is another: the M.I.T. student, and how he changed, and what finally brought to this campus scenes familiar to Berkeley and Harvard.

History has brought ironies. No one could foresee in 1960 that M.I.T.'s role in the arsenal of democracy would become at decade's end the center of great controversy. Yet it is not so odd; M.I.T.'s trouble is America's. What else could be expected at a time when millions of the nation's youth are joined in denunciation and resistance of a government and economic-political system that cannot seem to meet the needs of millions of its citizens, that seemingly ignores the destruction of its environment while siphoning men and treasure into a war longer than any other in our history?

The Institute has never been isolated from the nation or the world; indeed, over the years it has been an integral part of the country's industrial and scientific "establishments." And proud of it. But when those establishments came under attack, especially the now-famed "military-industrial complex," no one could expect the university sometimes called "the Second Pentagon" to escape criticism entirely.

The point is simple: As long as M.I.T. is so involved in the nation's affairs, it will share the nation's maladies. So when student discontent became one of those maladies during the Sixties, it inevitably came to M.I.T.

Not that today's student body is in any sense united in opposition to weapons research, MIRV, the Pentagon, and the military-industrial complex. On the contrary, the diversity of viewpoints among M.I.T. students is bewildering. We have our radicals—their numbers, incidentally, are growing—and our right-wingers, but there is a vast spectrum in between. The political average, though, is somewhat left of the nation as a whole.

A majority of students, as President Howard W. Johnson has noted on several occasions, clearly oppose the war in Vietnam. A majority seem to oppose weapons research, at least on campus. Most favor "conversion" of some sort: less war research, more work on domestic problems such as poverty, pollution and the cities. Realizing this, and supporting the idea, the administration has made moves in the direction of conversion and is encountering difficulties

which apparently can only be resolved by a shift in federal funding allocations from military research into other fields. That, however, is another story.

"Freaks" and "Counter-Culture"

Here is an anecdote about the changing character of the M.I.T. student body. A Wellesley girl who had never before visited the Institute was helping sell concert tickets in the Building 10 lobby. After a while, she remarked to her M.I.T. companion, "I didn't know M.I.T. was so loaded with freaks!"

Freaks? Long haired, bearded creatures, kin and descendants of hippies, pot smokers, Agnew's effete snobs? Here? Yes. But the surface development typified by the late sixties' explosion of hair must be seen in a wider context. To come to Boston these days, to visit Harvard Square or any place frequented by the college population is to realize that the so-called "counter-culture" is becoming dominant among many segments of the nation's youth.

But to begin properly, we must return to the beginning of the decade. Remember that today's undergraduate has lived almost half his life since John F. Kennedy's "Ask not . . ." Inaugural Address. Our character and life style have been molded during years which saw civil rights marches transmuted into riots on one hand and a massive antiwar movement on the other. J.F.K. called upon us, the young, to renew the American promise and seek the New Frontier. The shining liberal dream grew through the middle years as Lyndon Johnson opened the war to annihilate poverty and invited us, the young, to be in its forefront. And then the denouement, as all the golden promises seemed to turn to ashes and we were faced instead with an ugly landscape of war, poverty, pollution, and rotting cities torn by violence. Small wonder many of us think something is terribly wrong.

Paralleling the J.F.K.-inspired growth of social consciousness were other trends. Rock music, long hair, drugs, free living, the assertion of individuality—these led to a rebellion against regimentation in schools and the nation generally. The hippies were its ultimate expression, but millions were affected.

Significantly, all the major thrusts among the young have been spearheaded by the brightest and most "intellectual" students, the elite, the group of students from which M.I.T., like Harvard, Yale, and Princeton, draws its students.

The Death of the "Tech Tool"

As the young in general changed through the decade, then, change also came to M.I.T. A university (as opposed to technical school) ever since the end of the World War II, the Institute's undergraduates have increasingly moved out of engineering curricula and swelled the School of Science and the other, non-technical departments. Students began demanding less restriction, more inde-

pendence—less grading, fewer requirements, more flexible programs, independent study.

And even the engineers changed. The old "Tech Tool" image is slowly dying (although wags insist he thrives on in East Campus), to be replaced by the image of the engineer or scientist who combines excellence in the laboratory with civic responsibility and humanistic, often esthetic or artistic concerns—an image which, incidentally, the faculty and administration has tried to create by admitting a student body with wide-ranging interests and accomplishments and by upgrading the humanities to a position on par with the scientific disciplines.

The results of those trends and policies may now seem ironic to those who championed them, but they are not so surprising. Encouraged to take an interest in the affairs of society, M.I.T. students did—in social service committees, civil rights committees and then committees to end the war in Vietnam. Activist students came to dominate student government and publications hastening the politicization of the campus. When, after the 1968 elections, a mood of bitter resentment set in—a cynical feeling that the system wouldn't respond to "legitimate" pressures—radicals began to crop up here. Sanctuary, Resistance, S.A.C.C., March 4, R.L.S.D.S. and November Actions are part of history now.

Let me hasten to note that participation in the November Actions by M.I.T. students never topped 300. But radicalism is always the tip of the iceberg. Ten times that number, over 3,000, marched in the Anti-War Moratorium protest on October 15. Indeed, sympathy with many of the goals of the November Action Coalition is larger than is evident on the surface. What kept most students from the demonstrations was the danger of violence, and the narrow political appeal N.A.C.'s leaders chose to make.

Although most of us agree that priorities need changing (less war, more socially useful work) nationwide and at M.I.T., we disagree on methods. M.I.T. students have a streak of individuality that makes debates over shades of political difference common.

But many things at M.I.T. will never be the same. The old faith in technology as the savior of mankind has been shaken and so have some of the basic assumptions of M.I.T.

There are nagging doubts and the potential for further student rebellion here, and the burden of proof is upon the nation and the Institute. In the final analysis, student unrest here, or anywhere, will be laid to rest only when the society as a whole finally mounts the long-awaited massive attack on its domestic and social ills.

If not, M.I.T. will see more turmoil. And as the Institute goes, so the nation.

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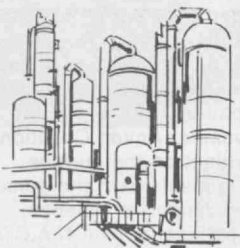
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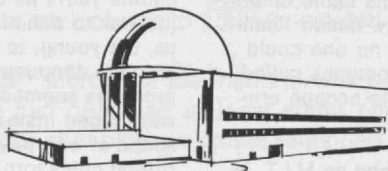
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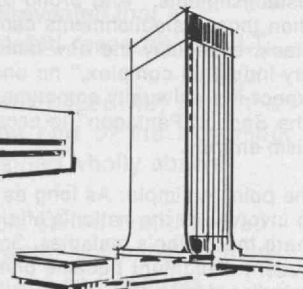


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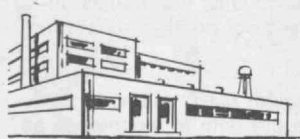
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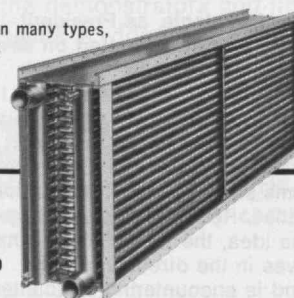
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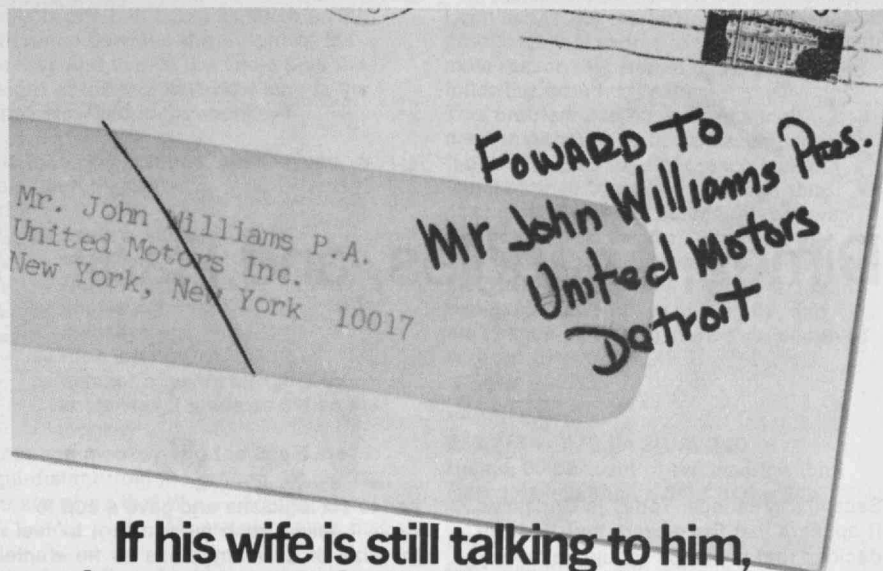
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Dimes, Triangles, and Radii

Season's greetings. Today is Christmas. It appears that the powers that be have decided that my dress should be "more contemporary." I now own a "semi-Edwardian" jacket and a bandana (which my 12-year-old cousin had to show me how to wear) à la "Midnight Cowboy." If my courage holds out I shall wear this outfit to class. When I ask my relatives why my teachers a M.I.T. were not required to be mod dressers, they explain that we are in a new era now (apparently the mid-1960's—pre-Armstrong—are bygone days).

More questions have come in concerning my amp. Currently it is unused, as a roommate has supplied a slightly inferior *but working* stereo set. Ron Kadomiya, '67, managed to isolate the trouble somewhat, but his mechanical engineering test equipment (a precision set of graduated sledge hammers) did not allow him to solve the mystery completely. Things are looking up now: John Forster, '67, has offered his assistance, and he has electrical engineering test equipment (a precision set of graduated pots [and pans?]) left over from his thesis. Last year Mark Yu offered a one-word appraisal of my problem: change brands. He may be right, but I'm hopeful that someone will get my set running properly.

Enough gab; on to the problems.

Problems

The first problem is from Philip W. Robinson:

16 Can you find a curve having non-constant radius of curvature such that all the centers of curvature lie on the x axis?

The second problem comes to us from David P. Dewan, who calls it "the problem of the six cups."

17 I placed 15 dimes and 15 nickels in six cups such that each cup contained the same number of coins but a different amount of money. I made six labels showing correctly how much money each cup contained, but attached to each cup an incorrect label. I explained the situa-

tion to six logicians and gave a cup to each. I asked each man in turn to feel the size of as many coins as he wanted in his own cup and announce something interesting. The only evidence each man had was the size of the coins he felt, the incorrect label on his own cup, and the statements made by those who preceded him. The first man said, "I feel four coins which are not all the same size; I know that my fifth coin must be a dime." The second man said, "I feel four coins which are all the same size; I know that my fifth coin must be a nickel." The third man said, "I feel two coins, but I shall tell you nothing about their size; I know what my other three coins must be." The fourth man said, "I feel one coin; I know what my other four must be." Then everyone knew how the remaining two cups were labelled and what the total value of money in those two cups was. Do you?

Here is a problem from Thomas B. Jabine, '48, which he says is "guaranteed to keep the solver occupied for several hours unless he happens to be very lucky. There is a solution, and no tricks (such as zeros to the left) are involved. There is no quick way to find the answer, but large classes of possible solutions can be readily eliminated in various ways."

18 This is a multiplication problem:

$$\begin{array}{r} x \ x \ x \\ x \ x \ x \\ \hline x \ x \ x \\ x \ x \ x \\ \hline x \ x \ x \\ x \ x \ x \ x \end{array}$$

Each of the 10 digits (0, 1, 2, . . . 9) is to be used exactly twice.

19 Given a triangle ABC and a point P, Smith D. Turner wants a method for constructing a line through P bisecting the area of the triangle.

John F. Mandl has submitted the following, which he says he's had in his file "for years." He says that C "is a remarkable mental gymnast to arrive at the answer without pencil and paper; the estimated time for solution for the average mortal is six hours."

20 A said to the farmer, "I know you own a rectangular plot in that 20-by-20 section, and I know the area of your plot. Is the length greater than twice the width?" B said to the farmer, "Before you answer let me state that I knew the width, and I now know the length." C said, "I did not know the length, width, or area, but now I know the dimensions." What are they?

Speed Department

Only one speed problem has been submitted; here it is (from John J. Sytek):

SD7 Where is the fallacy in the following:

$$\text{For all } \theta, \quad e^{i\theta} = e^{i02\pi/2\pi} = (e^{2\pi i})^{\theta/2\pi} = 1^{\theta/2\pi} = 1$$

Solutions

1 Obtain rational factors of $x^8 - 4x^4y^4 + 16y^8$

Judith Q. Longyear and Francis T. Leahy, Jr., have shown that no linear factors exist. The solution expected by the proposer, Smith D. Turner, is: In general, $A^4 - B^2A^2 + B^4$ cannot be factored unless it can be put in the form $M^2 - N^2$, which requires that $2AB$ be a perfect square. In this case that requirement is fulfilled, since $2AB$ is $4x^2y^2$. So $x^8 - 4x^4y^4 + 16y^8 = (x^4 + 2x^2y^2 + 4y^4)^2 - (2xy)^2(x^2 + 2y^2)^2$, which is in the form $M^2 - N^2$ and can be arranged to yield $(x^4 + 2x^3y + 2x^2y^2 + 4xy^3 + 4y^4)(x^4 - 2x^3y + 2x^2y^2 - 4xy^3 + 4y^4)$. Mr. Turner notes that "the solution may be difficult without this gimmick."

2 For the real symmetric matrix Q , let $\Delta = \det(Q)$ and $\Delta_0 = 1$. Let Δ_{n-t} be the determinant of Q with its last t rows and columns deleted. It is well known that Q is positive semi-definite if all principal minors of Q are ≥ 0 and $\Delta = 0$. Is this last condition equivalent to some (seemingly weaker) condition? (For example, one might conjecture a condition such as " $\Delta_0, \Delta_1, \dots, \Delta_n \geq 0$ and $\Delta = 0$," which involves only the leading principal minors. This, though, is clearly

insufficient.) Such a weaker condition could be of use in determining whether a matrix is PSD, especially if it uses little more than $\Delta_0, \Delta_1, \dots, \Delta_n$.

No takers, so far. Keep at it.

3 The contract is six spades, and the opening lead is $\spadesuit 3$. Play to make it.

North	
♥ A K 8	
♥ —	
♦ A K 8 6	
♣ A K J 10 8 2	
West	East
♠ Q 9	♠ J 6 3
♥ K J 10 6 2	♥ 8
♦ Q 7 4 3	♦ J 10 9 4 2
♣ 7 5	♣ Q 9 6 4
South	
♠ 10 7 5 4 2	
♥ A Q 9 7 5 4 3	
♦ —	
♣ 3	

The following is from Winslow H. Hartford, who writes that he is "still enjoying Puzzle Corner and solving a few when time permits or the 'new math' isn't too much involved. However, bridge problems and Diophantine equations remain my forte." As to this problem, he notes that it "would be a tough hand to play first crack out of the box, but its secret is timing. Dummy's clubs must be established by immediate ruffs; so the discard on the first trick is a club rather than the more obvious heart." The play as he proposes it:

Trick	W	N	E	S
1	♦3	♦A	♦2	♣3
2	♣5	♣2	♣4	♠2
3	♠9	♠K	♠3	♠4
4	♣7	♣8	♣9	♠5
5	♥2	♦6	♥8	♥A*
6	♠Q	♠A	♠6	♠7
7	♥6	♣K	♠6	♥3
8	♥10	♣A	♣Q	♥4
9	♦4	♣J	♠J	♥5†
10	♦7	♦K	♦J	♥7
11	♥J	♣10	♦4	♥9
12	♦Q	♦8	♦9	♠10
13	♥K	♠8	♦10	♥Q

*South must cash ♥A before the hand is dead.

†East can take his ♠J any time.

Also solved by Stanley A. Horowitz, Elmer C. Ingraham, Leon M. Kaatz, Atma P. Lalchandaani, Francis T. Leahy, Jr., Michael Mann, John P. Rudy, Ruth Turner, and Eric Weitz.

4 A monkey and his uncle are suspended at equal distances from the floor at opposite ends of a rope which passes through a pulley. The rope weighs four ounces per foot. The weight of the monkey in pounds equals the age of the monkey's uncle in years. The age of the uncle plus that of the monkey equals four years. The uncle is twice as old as the monkey was when the uncle was half as old as the monkey will be when the monkey is three times as old as the uncle was when the uncle was three times as old as the monkey. The weight of the rope plus the weight of the monkey's

uncle is one-half again as much as the difference between the weight of the monkey and that of the uncle plus the weight of the monkey. How long is the rope? How old is the monkey?

The following solution, neatly typed, is from Leon M. Kaatz:

Let
 W_u = uncle's weight (lbs.)
 W_m = monkey's weight (lbs.)
 W_r = rope weight (lbs.)
 A_u = uncle's age (yrs.)
 A_m = monkey's age (yrs.)
 L = rope length (ft.)
 K = number of years ago that the uncle was 3 times as old as the monkey

Since the monkey and the uncle are equi-distant from the ground, $W_u = W_m$. We are given that $W_m = A_u$, therefore $W_u = W_m = A_u$. We are also given that $A_u + A_m = 4$.

Now, $A_u - K = 3 \cdot (A_m - K)$ by the definition of K . Therefore, $3 \cdot (A_u - K) = \text{age of the monkey when the monkey is three times as old as the uncle was when the uncle was three times as old as the monkey was.}$

Therefore, $(3/2) \cdot (A_u - K) = \text{age of the uncle when the uncle was } 1/2 \text{ as old as the monkey will be when the monkey is 3 times as old as the uncle was when the uncle was 3 times as old as the monkey was.}$

Now we are given that the uncle is twice the age that the monkey was when the uncle's age was $(3/2) \cdot (A_u - K)$. But, $A_u - (3/2) \cdot (A_u - K)$ is how long ago the uncle's age was $(3/3) \cdot (A_u - K)$.

Therefore, when the uncle's age was $(3/2) \cdot (A_u - K)$, the monkey's age was $A_m - [A_u - (3/2) \cdot (A_u - K)]$, or $A_m - 1/2 \cdot (3K - A_u)$. Since the uncle is twice this age, we have $A_u = 2A_m - 3K + A_u$, or $A_m = 3K/2$. Substituting this into the equation $A_u - K = 3 \cdot (A_m - K)$, yields $A_u = 5K/2$. Therefore $A_u = (5/3) \cdot A_m$, and since $A_u + A_m = 4$, we get

$$A_u = 2\frac{1}{2} \\ A_m = 1\frac{1}{2}.$$

Next, we are given that the weight of the rope plus the weight of the uncle is half again as much as the difference between the monkey's weight and the weight of the monkey plus the uncle. Mathematically, this is:

$$W_r + W_m = (3/2) \cdot [(W_m + W_u) - W_m].$$

Since $W_m = W_u = A_u = 2\frac{1}{2}$, this becomes $W_r = 1\frac{1}{4} \text{ lbs.} = 20 \text{ oz.}$ Since the rope weighs 4 oz. per ft., the rope must be 5 feet long.

Well I'll be a monkey's uncle, I actually solved that one.

Also solved by J. Douglas Doxsey, Sharon Hubbard, Edgar Keats, James W. Royle, Jr., G. W. Stratfort, and Benjamin Whang.

5 Three thespians came on a cache of bright, shining obols and decided to share it. Silimon took some coins, and Stupidas also helped himself. What is the probability that at most one-third of the coins were left for Preposterous?

I confess to not totally understanding this problem. What seems to me to be the most reasonable submitted solution is the following from Mr. Leahy:

This problem has no mathematical answer without additional assumptions. If all three grab together, each has an equal chance of getting over one-third, of course. If the first selects at random any percentage that he'd like, and the second selects at random any percentage that he'd like of what's left, the last man can expect one-fourth of the pile; and his chance of getting more than one-third is given by:

$$\int_{0.33}^{1.00} \frac{y - 0.33}{y} dy =$$

$$2/3(2/3 - 1/3 [\ln 3]) = 0.20$$

Hence, 80 per cent of the time the third man gets less than a third of the pile.

Elmer C. Ingraham and Smith D. Turner also responded, and Jerome I. Glaser has the following alternate solution, which he says results in the answer $1/3 (1 + \log_e 3)$, or about 0.7:

Assume that the large cache contains N coins. The probability that at most $N/3$ coins are left for Preposterous is equal to one minus the probability that the combined take of Stupidas and Silimon is less than $2N/3$. Let n_1 be Silimon's take and n_2 be Stupidas's take. The joint density of n_1 and n_2 is $(1/N)(1/N - n_1)$ and the probability is

$$p = 1 - \int_0^{2N/3} (dn_1/N) \int_0^{2N/3 - n_1} (dn_2/N - n_1) = 1 - (2/3 - 1/3 \log_e 3).$$

Allan J. Gottlieb, who studied at M.I.T. with the Class of 1967, is a teaching assistant at Brandeis University. Send solutions, new puzzles, and other correspondence to him at the Department of Mathematics, Brandeis University, Waltham, Mass., 02154.

January Tech-Crostic Solution

Bilateral networks with several inputs and several outputs must be transformed into the equivalent unilateral networks. Non-linear operators either may be a function of the input signal only or may be a function of a second input as with automatic gain-controlled amplifiers.

(O. J. M.) Smith, *Feedback Control Systems*

I. German discoverer of a compound of mercury and selenium.

126 43 53 137 196 87 147

J. An array of symmetry elements in three dimensions on a space-lattice (2 words).

59 182 93 190 37 160 16 99 51
195

K. Gypsum, kaolin, magnesium (2 words).

4 118 210 77 103 175 28 44 41

L. Hypostatized.

171 25 107 95 167 55 38

M. Relax (colloq.).

24 194 14 125 129 162

N. Sweetmeat.

33 152 82 20 116 7

O. Rope, chain; range, limit.

62 17 168 114 189 180

P. Parallelepiped formed by the network of lines through the points of a space-lattice (2 words).

58 159 136 150 170 201 94 109

Q. Swagger; brag; indulge in riotous activity.

9 143 86 32 205 64 106

R. Exhausted of fertility; spent.

22 164 12 48 90 70

S. At another time (archaic).

193 1 73 124 76 208 155 18 69
105

T. First U.S. Secretary of Defense.

142 204 92 34 169 65 113 212 120

U. Soldierly.

67 111 199 15 85 214 89

V. Critical explanation of a portion of scripture.

163 213 5 80 74 132 187 101

W. Inflammation of a gland in the neck.

50 206 29 63 178 145 186 209 72
158 134

X. Mystical word supposed to ward off diseases when written triangularly and worn on an amulet.

13 54 46 161 185 119 30 39 97
52 122

Y. Reduce to a fluid state.

202 192 23 100 3 42 140

Z. Intuition (2 words).

40 151 49 104 183 71 60 26 130
207

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Social Justice and the Frontier

To the Editor:

The excellent article by Victor K. McElheny in the July/August issue (pp. 10-11) concluded with a paragraph that would have much better been left out, because it demonstrated the reason for the popular feeling that scientists and engineers ought to learn more about sociology and economics.

Science cannot "open new material frontiers which make the closing of the territorial frontier irrelevant" for the simple reason that new lands, while they were available, protected the poor man without industrial skills because he could always move to the edge of town or of civilization and pick out the best piece of land not owned; in time a community would grow, and he had a good chance to get along if not prosper.

Developments arising out of science cannot help the poor in this manner, for the new material frontiers which result benefit only those who own the land and raw materials. I concede from this that in the long run even the children or grandchildren of the poor may benefit, but the territorial frontier gave men hope immediately, and its closing cannot possibly be made irrelevant.

As an engineer over 46 years in practice, I often wish that our profession and the scientific profession would show more interest in the meaning of a "people" as distinct from a material problem. I will be grateful if you will bring this to Mr. McElheny's attention.

Norman Weiss
Tucson, Arizona

Mr. McElheny responds as follows:

As someone who has read political history of Europe and America for the past 20 years, who majored in sociology in college, worked in a mental hospital as part of a college course, wrote a senior paper on the psychology of political opinions, hitchhiked around the country summer after summer, worked on fishing boats and as a busboy in a racetrack restaurant, worked for five years on a southern newspaper covering crime and

race relations and organized labor as well as science, and visited many of the leading science and engineering laboratories of India, I can share Norman Weiss's wish that scientists and engineers have a more compassionate mental picture of the unchanging wishes and dreams of people whose lives they often change so brutally. They should be particularly aware of technological developments which can make a whole class of people economically useless, like the field hands of the Cotton Belt. Thrown off the land where they were exploited, these people now live in a northern ghetto, unemployed or underemployed, economically better off and so, more bitter. Such psychological frontiers may be more important than any material frontier. But it must be accepted that material things, conferred upon us by science and technology and the drives of salesmanship, are the ground on which feelings grow. At least half of all real economic growth is new technology, the new land. Continued economic growth is indispensable to social justice.

Rosy Glasses and Marine Food

To the Editor:

In the October/November issue of *Technology Review* (pages 73-74) Jerry E. Cook reports, "... this immense potential for reproduction has made shrimp the subject of one of the world's first successful programs to farm the sea."

I have two questions. First, how can he claim that shrimp are one of the world's first successful programs to farm the sea when it is well known that, among others, the Spanish and French have long farmed mussels, the French and Japanese have long farmed oysters, and the Japanese have long farmed the alga, *Porphyra tenera*? He must be using some rather refined definition of farming.

Second, who has successfully farmed shrimp and for how long? I was in Japan for a year, 1955-1956, studying Japanese marine farming among other things and was disappointed to learn from Professor Takasi Tokioka that the successful farming of their shrimp, kuruma-ebi, by Dr. M. Hudinaga had failed economically. This enterprise was given wide publicity in the *National Geographic* magazine,

but the subsequent failure of the enterprise was never widely announced. The failure of the commercial venture is rather surprising when one considers that kuruma-ebi was selling wholesale in Japan at that time for \$6 a pound. I know that experiments to produce shrimp commercially by farming are underway in Florida, but I remain unconvinced that this venture will be successful. I know of no marine farming in the world (excepting possibly the mussel farms of Spain) that is not producing luxury items or luxury food. With Japanese nori selling at \$36 a pound in Dayton and about half that price in Japan, I do not see marine algae as any solution to the world food shortage; and Gulf of Mexico shrimp will not make much of a dent either. European and Asian marine scientists have long held a conservative if not pessimistic view of the difficulties of extracting food from the sea. I am glad to see that some American marine scientists are beginning to have some doubts about our ability to increase markedly the present world harvest of marine food. I am fairly satisfied that the American public has been lead for too long down the rosy path of optimism about what the oceans can do for the world food supply, and I wonder where you all get your pale red glasses.

Robert Bieri
Yellow Springs, Ohio

The writer is Associate Professor of Biology at Antioch College.—Ed.

Mr. Cook responds as follows:

I have taken farming the sea to mean the raising of organisms in a controlled environment with a regulated food supply. In your listing of other successful pioneer programs, you neglected the ones most relevant to my article, those in India, Indonesia, and the Philippines, where small shrimp are caught and raised to maturity in ponds. Such practices do not, however, constitute what I consider a truly advanced method on the level of that discussed in my article.

I have visited numerous shrimp-raising facilities in Japan during 1968-69, primarily in the Yamaguchi Ken area of the Inland Sea. Generally, the shrimp raisers purchase the fry when they are three

weeks old from laboratories that specialize in the hatchery operations. The growers' principal difficulty has been obtaining a cheap food (see my article). This, combined with the expense of suitable land for ponds and the cold winter water temperatures, has hampered commercial operations which, nonetheless, are successful. In Okinawa, where the water temperature is warm even in winter, preliminary experiments indicate the possibility of two crops per year. Another innovation has been the use of the heretofore useless African snail for food.

At present, the Japanese are providing technical assistance on commercial shrimp raising in France, Korea, and the Ivory Coast. These programs were begun this year and their results cannot be ascertained for a few more months. In the U.S., the University of Miami, the Bureau of Commercial Fisheries, and a private group in Panama City, Florida, have basic research or prototype experiments underway.

Your remarks regarding the caution to be exercised in predicting a dramatic increase in world food resources due to culture of marine organisms are well taken. It has required over 30 years of basic research and a highly favorable market situation to give shrimp culture enterprises the degree of success they enjoy. One expects a gradual maturation of marine culture industries, rather than an overnight blossoming.

"Ashamed of M.I.T."

To the Editor:

In the *Washington Post* for October 24, 1969, there appeared a nationally syndicated column by Joseph Alsop headed "Academic Freedom Imperiled by Firing of M.I.T. Professor." The article is concerned with the work being done at the Instrumentation Laboratory and Lincoln Laboratory. The essence of the article is that C. Stark Draper was fired due to the power of Professor Noam Chomsky (who is somewhat left of center) and was engineered because of Professor Draper's excessive loyalty to the United States. Two of the most significant paragraphs in the Alsop column are:

"Professor Chomsky and his violence-prone followers in the student body are convinced that defense-linked research is socially undesirable, to put it very mildly! And they therefore want M.I.T. to tell their colleagues at the Instrumentation Laboratory, and the great Lincoln Laboratory, as well, to 'stop it at once.'"

"The real issue, in sum, is very plain. Are men like Professor Draper to be allowed to choose their own research projects, as academic freedom unquestionably demands? Or is academic freedom to be generally suspended for members of university faculties who are guilty of excessive loyalty to the United States."

While Mr. Alsop uses more violent rhetoric than this writer, the article does

raise a point for serious discussion by those concerned with the future of M.I.T.

As a strong believer in academic freedom and nongovernmental control of education, particularly in schools of higher learning, I feel that it would be tragic if M.I.T. should eliminate research (or restrict research) in the field of defense of the United States, because either a small portion, or even a majority of the faculty and students were opposed to such research. (For the record, I am neither a hawk nor a dove on the Vietnam issue).

This letter is being written just after the writer heard a news report of the inaction by President Howard W. Johnson after occupation of the M.I.T. "administration building" by protesters (student and non-student). This is one of the few times that I, as an alumnus, have felt ashamed of being associated with M.I.T. The dissidents of this country must sometime be made to realize that theirs are not the only rights. Academic freedom is a precious thing, not to be tossed aside lightly for fear of conflict with individuals who are attempting to suppress it. There comes a time when action is more important than words. In my opinion, President Johnson has failed to take the necessary action to assure the maintenance of M.I.T.'s justifiable reputation as a great institute of learning.

Alvin Gutttag, '40
Washington, D.C.

Industrial Hot Water for Home Heating

To the Editor:

As I read your article "Can the Farmer Use Heated Water?" in the October/November issue (page 75), I was reminded of some thinking I did several weeks ago. As I pondered the air-polluting properties of fossil fuels and their eventual disappearance as mines and wells are emptied, I wondered whether some other method of heating houses could be easily devised. The example of Iceland occurred to me—there, homes are heated by hot water pipes fed by boiling springs. We don't have an abundance of boiling springs in this country, but we have a lot of factories spewing out hot water. Can't homes be heated by this method? Can't we use one problem to solve another?

My eight-year-old son is more of a pessimist than I. He says, "Who would pay whom for what?" That's another problem.

Judith Eckerson
Washington, D.C.

Mrs. Eckerson, a graduate student at Georgetown University, is Editor of the Federation of American Scientists Newsletter.—Ed

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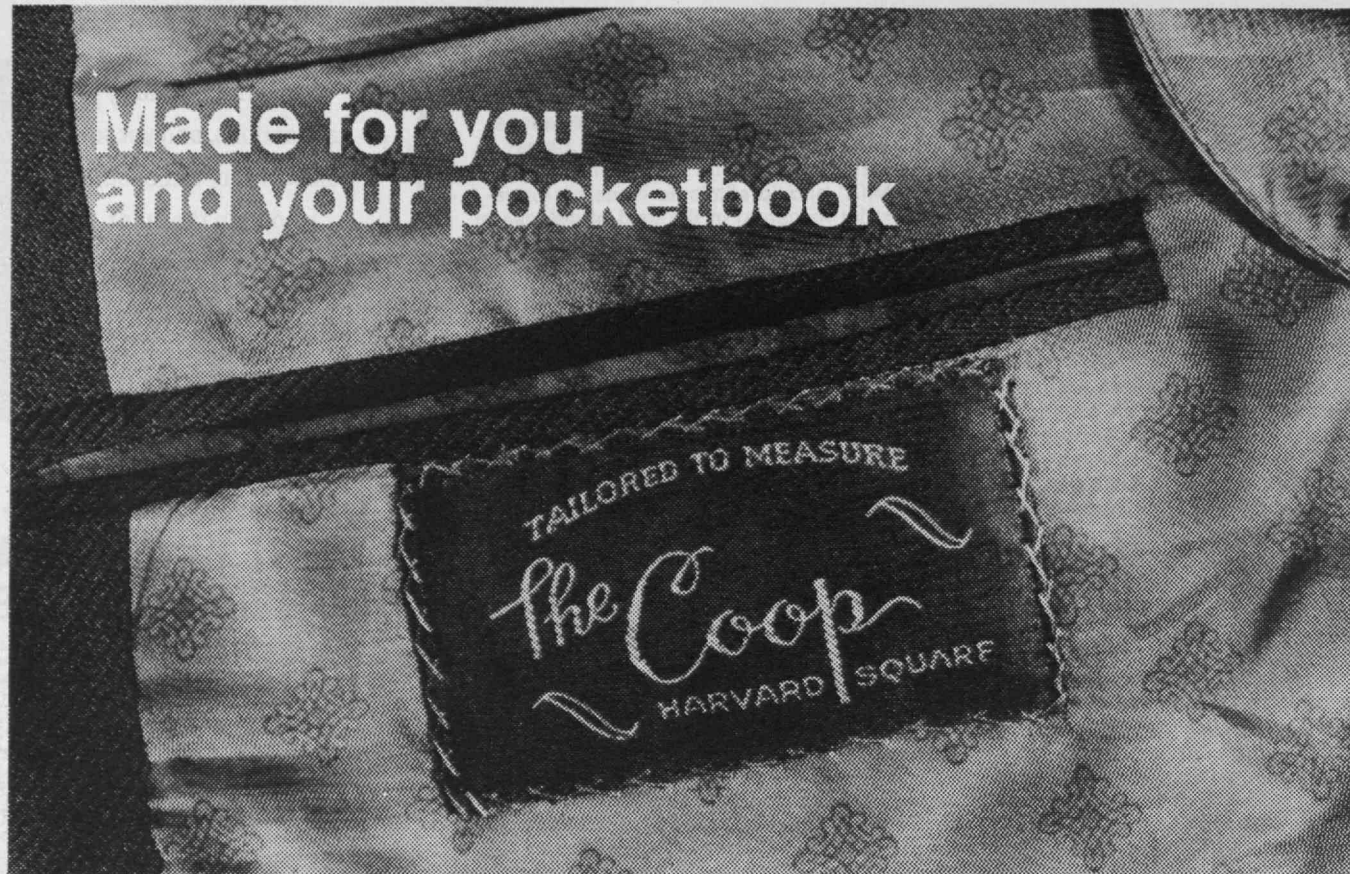
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Institute Review

Youth and the Perfection of an Imperfect World

There is a canyon—a deep chasm—between American business and American youth. But its sides may not be quite as precipitous as some of the principals think.

Modern youth claims disdain for material wealth. Then is the essence of goodness inflicting upon everyone else in the nation and world that which we ourselves despise?

No, you read us wrong. We are talking not about goods but about opportunity. What all men must have is a chance to choose what will be their future and the ability to effect their choice.

Dialogues like this filled the plush auditorium of the Ford Foundation in New York on December 9, when the M.I.T. Alumni Center of New York brought four experts on industry and the generation gap and five M.I.T. students together for a one-day discussion of "Today's Youth: Tomorrow's Executives." Walter A. Rosenblith, Associate Provost of M.I.T., was Chairman, and visitors were welcomed to the Ford Foundation by its Chairman, Julius A. Stratton, '23, President Emeritus of M.I.T.

At least two words used commonly on both sides of the canyon between business and youth were given new perspective during the day: violence and environment:

"Nonviolence is a refusal to violate the essence of another person. If we have the power to extend the life of a Brazilian who will die tomorrow, it is *violent* for us not to do so," said William Sloane Coffin, Jr., Chaplain of Yale University.

"Eighty per cent of the Bell System's new employees in the decade of the 1970's will be central city residents, products of central city high schools; they will be moving from a place where no one made commitments to them to a place where they are expected to keep commitments to others. I conceive this to be an *environmental* problem," said Walter W. Straley, Vice-President of the American Telephone and Telegraph Co.



Five M.I.T. students joined Walter A. Rosenblith, Associate Provost of M.I.T., Yale's Chaplain William Sloane Coffin, Jr., (top left) and three successful businessmen to talk about the generation gap and what it means to business at an all-day seminar of the M.I.T. Alumni Center of New York on December 9. Julius A. Stratton, '26, Chairman of the Ford Foundation (in whose auditorium the seminar was held), opened the meeting (top, right) by observing his frustration

that while we speak of a communications gap we are "engulfed" in communication, "a roaring background of noise," he called it. At the end of the day, Professor Rosenblith noted the special hazard of what he called "the decomposition system: if you can reduce a problem to its simple units you can deal with it." But this approach, he said, "makes us special-purpose wise but general-purpose foolish."

Is the Profit Motive Obsolete?

Dr. Stratton opened the day with an unanswerable question: The successes of our nation serve to bring into sharper focus our shortcomings. But can our industry find incentives to attack the country's new problems without vacating its present commitments, leaving the system without support? "The problems arising out of technological change seem not to offer profit for those who will solve them," said Dr. Stratton, "and the profit motive is the essence of private enterprise."

By the end of the day Professor Rosenblith had concluded that "we need a new kind of cost-benefit analysis, a kind of resource calculus which does not diminish some men as it aggrandizes others, to replace the profit system." Paul V. Keyser, '29, Chairman of the Alumni Center of New York, suggested that this might be the concept of long-term survival. "There is a much higher degree of moral sensitivity in the average company than our young people realize," he said. "If we are basically committed to long-term survival, then our purpose will simply be to make this the kind of country where we can all get together on that common purpose."

But how about the transnational company? asked Richard L. Evans, '70, a student in the M.I.T. Sloan School of Management. How does it formulate its goals when the interests of the country in which it operates, which has cheap materials and labor, are different from those of the U.S.?

"We are told to be free," said Rev. Coffin, "but we are taught to be docile. What is the point of being conscientious when you are only semiconscious of the things to be conscientious about?"

The success of our system makes possible freedom for many of our youth, Rev. Coffin noted, "but our success is immoral when it deprives our brother of enough to eat." Or put another way by Gary Gut, '70, whose M.I.T. major is biology, the trouble with the free enterprise system is that it presents artificial obstacles to achieving for every human the basic rights of good food and good health.

"The essence of humanity," said Karen Wattel, '70, an economics major, "is the removal of constraints."

But "most of the young people I know haven't been told the truth," replied Charles P. Lecht, President of Advanced Computer Techniques. "Somebody should have told them that the world is imperfect; the only victims of revolution are the revolutionaries themselves."

More Than Times Have Changed

"The Massachusetts Institute of Technology is interested not only in turning out well-trained engineers but makes every effort to develop in its students those attributes of character that distinguish the well-rounded and educated man from the merely technically trained engineer." This is what the entering freshman in 1928 was told about how to get on at M.I.T.

In those days, the Handbook contained such rules as: "Freshmen are expected to speak to all members of the faculty and to tip their hats to the President of the Institute and the Dean," and "Freshmen should not loiter around the Main Lobby, or sit on the benches in the Lobby. If Freshmen win Field Day, this restriction should be abandoned."

But times have changed. And styles. Now the entering freshman gets a new Handbook with the title of a true bestseller—HoToGAMIT—meaning, How To Get Around M.I.T. It was compiled last summer by Stephen C. Ehrmann, '71, working for the office of the Dean of Student Affairs, who claims he got the *real* story from the secretaries who sit outside those inside offices.

Instead of the old here-are-the-words-of-your-school-song-now-let's-all-sing-together approach of earlier M.I.T. Handbooks, HoToGAMIT has a slightly different message. A sample of the advice to be found in the introduction, "Here's How":

"M.I.T. is a bunch of people obeying people-type laws of behavior. Consequently, it can be very flexible or extremely cranky, depending on how it is approached.

"a. 1 is greater than 0: one person can do more things than zero persons; if you don't complain or suggest, nothing will happen.

"b. $N + 1$ is greater than N : if you get a friend to join you, more will happen. This is particularly effective if one of you goes in, officially representing the other. If temporarily at a loss, you can say, 'I understand your viewpoint, perfectly, but my friends are still awfully irritated,' or words to that effect."

The other message, a corollary of the first, is stated thus: at M.I.T. "sometimes the roof is near to falling in. Sometimes it is just chips of plaster that get in your eyes. You are, however, among friends."

Being among friends is clearly the emphasis, through the repeated pleas to students to "talk to faculty" ("if a faculty member says, 'Go away, don't bother me,' it really means, 'I'm busy now but you can try a little later.'"), to the psychiatrists (they are "good at listening to people-type problems"), the secretaries (names given), the deans ("If you want a date ask Dean Hammerness"), and, of course, Wellesley. It is filled with all kinds of relevant and irrelevant data, and organized, sort of: "To find where the Coop was in 1922, see page 38." Or, "To find where the M.I.T. collection of mystery stories is, see: Libraries, page 27."

The book is obviously witty, possibly useful, and it has a touch of acidity as well. Each section is headed with quotations from older handbooks (including 1928) as well as from other sources. Examples: "Now you'll notice that M.I.T. always puts education before research in its publicity but puts research before education in the budget."

"We tend to spend about six months intellectualizing about any problem before we admit that our initial visceral reaction of 'yug' was correct."

Examples from the glossary in the back:

"HahvaHd: the place Both Up The Street and Up The River.

"M.I.C.: Military Industrial Complex, not to be confused with M.I.T."

"Cenotaphe," a stainless steel work by the French sculptor Jean Robert Ipousteguy, was given to M.I.T. two years ago by Leon A. Kolker, '31. Now it has been placed in the courtyard of the Karl Taylor Compton Building on the main campus.



Living on Top of Ideas, and A Revival of Medievalism

"If everybody had a banker like M.I.T., there would be no recessions," Carroll G. Bowen, Director of the M.I.T. Press, told Donald White of the *Boston Globe* this fall. Its freedom to invest money in important books is one reason for the M.I.T. Press' success, said Mr. Bowen; but a bigger one is "the tremendous intellectual reservoir which we can tap. Ideas are the commodity at M.I.T.," he said, "and we live on top like the froth."

After six years at M.I.T. as Director of the Press—during which its annual sales have gone from \$487,000 to \$2,250,000—Mr. Bowen left at the end of 1969 to become President of Franklin Book Programs, Inc., a foundation dedicated to the book publishing overseas. Behind him Mr. Bowen will leave a publishing organization of over 50 people (nine in 1963) with a catalog of 95 titles (43 in 1963). Present estimates are that it will show a profit of just over \$110,000 in 1969.

But profit is not the point. As the late

Thomas J. Wilson, for 20 years Director of the Harvard University Press, said, "A university press exists to publish as many good scholarly books as possible short of bankruptcy." Hence Mr. Bowen's enthusiasm for the financial support of M.I.T. behind efforts of the M.I.T. Press.

Most of the M.I.T. Press's scholarly books are published in editions of 2,000 to 2,500 copies. A few become best-sellers—like *Beyond the Melting Pot* by Nathan Glazer and Daniel P. Moynihan, which has sold over 150,000 copies; or the three-volume *Mathematics: Its Content, Methods, and Meaning*, of which 13,000 sets have been sold. In general, larger financial successes have come through the M.I.T. Press's entry into the paperback field, three years ago, where volume and margins are higher.

What next? Mr. Bowen predicts continued sales growth of the M.I.T. Press by about 15 per cent a year with a slower (3 per cent) annual growth in number of titles and staff and, eventually, some changes in book publishing wrought by new technology. Could each author and potential author have a computer keyboard in his office, connected to a program for storing, editing, and typesetting manuscripts? "It would be like medieval days," Mr. Bowen speculates, "when the monks were both authors and composers."

The First LeBel Professor

Amar G. Bose, '27, has been chosen as the first Clarence Joseph LeBel ('26) Professor of Electrical Engineering at M.I.T., an endowed professorship which honors one of the Institute's distinguished industrial scientists in that field.

As the LeBel Professor, Dr. Bose "will have a broad leadership role in the Department's teaching and research activities in the fields of audio engineering and acoustics," according to Raymond L. Bisplinghoff, Dean of the School of Engineering, who announced the new appointment. "Dr. Bose is known and respected as one of M.I.T.'s great teachers," he said.

Dr. Bose holds three degrees (S.B., S.M.,

and Sc.D.) in electrical engineering at M.I.T., and he was appointed to the faculty upon completion of graduate study. Since then he has become known for "imaginative and forceful research in the areas of acoustics, loudspeaker design, two-state amplifier-modulators, and nonlinear systems," according to Dean Bisplinghoff; Dr. Bose holds awards for effective teaching from M.I.T. and from the American Society for Engineering Education.

Mr. LeBel's industrial career culminated with more than 10 years of service with Audio Devices, Inc.; he was for several years Vice-President of the company and President and Chief Engineer of Electroacoustic and Electronic Measuring Instruments of Audio Instrument Co., Inc. Mr. LeBel was a founder of the Audio Engineering Society and served as its President in 1958.

Nutrition Teaching Awards

Students of the Department of Nutrition and Food Science have presented "excellence in teaching" awards to two faculty members this fall.

The recipients were Marcus Karel, Ph.D. '60, Professor of Food Engineering, and Richard J. Wurtman, Associate Professor of Endocrinology and Metabolism. Dr. Karel has been associated with the Institute since 1953 and began teaching in 1961. Dr. Wurtman joined the M.I.T. faculty in 1967. Both are members of the student-faculty committee within the Department.

The awards were made on the basis of a poll distributed to all students in the Department, in which professors were rated on preparation, general interest in their teaching role both inside and outside the classroom, and availability to students. H. P. Hood and Sons presented honoraria to the awardees.

Freshman Advisory Council

Hale V. Bradt, Ph.D. '61, Associate Professor of physics, has been named chairman of the Freshman Advisory Council; he succeeds Gian-Carlo Rota, Professor of Mathematics, who—after serving for the past year as Chairman

The "Boston brick" front of 111 Bay State Road hides M.I.T.'s first experiment in co-educational living—which, it turns out, is no more "turned on" than the building itself. The tenant is the M.I.T. Student House, a cooperative in which the students do all the housekeeping except the cooking, for which they hire a professional. With 25 men and six girls in residence, there are domestic scenes a-plenty but none of them is big. It's only the postman who isn't used to the idea yet. (Photos: Charles E. Kushner, '72)

of the Council—has asked to return to full-time teaching responsibilities.

Through the Freshman Advisory Council, M.I.T. seeks to provide individual counseling to entering freshman and to those sophomores who have not designated a departmental major in their second year. As Chairman, Professor Bradt will work closely with the faculty who serve as advisers to first-year students and with committees and administrative offices concerned with the first-year program.

Professor Rota has directed the Council "with dedication and skill," said President Howard W. Johnson in announcing the change, "and he has made imaginative contributions to the development of the Institute's advisory system."

Walter L. Whitehead, 1891-1969

Death came after a long illness to Walter L. Whitehead, '13, Associate Professor of Geology, Emeritus, in Cambridge on December 2. He was 78 and had retired from active professional work at M.I.T. in 1962 after 35 years of teaching and research here.

Professor Whitehead studied at M.I.T. for bachelor's and doctorate (1918) degrees; he served in the U.S. Army and did geological field work in South America, Australia, Asia, and the U.S. before returning to teach at M.I.T. in 1928; and thereafter he was the Department's specialist in the geology of petroleum, coal, and associated sediments. He organized and directed a 10-year study of the role of radioactivity in the formation of petroleum hydrocarbons, and he later completed a six-year study of the thermographic analysis of coal.

Professor Whitehead's early field experience made him a strong proponent of field training for all geologists; he organized M.I.T.'s courses in mapping and field geology when he joined the Department, and he was instrumental in establishing the Nova Scotia Centre for Geological Sciences as the site of a summer school in geology for M.I.T. students. As Director of the Centre for 10 years beginning in 1948, Professor Whitehead supervised the field training

of more than 350 students from M.I.T. and other institutions.

Memorial contributions may be made to the Walter L. Whitehead Fund at M.I.T.

M.I.T. Student House: Now There's Someone to Darn Your Socks

The referee objected ("Wait a minute, that's a girl!") when a co-ed was put into an intramural football game as quarterback for the M.I.T. Student House this fall. But the objection was overruled: she lives there.

So do five other girls, and 25 men. It is M.I.T.'s first experiment, on a small scale, with co-ed living.

Student House itself is an old, and unusual, M.I.T. institution—a "cooperative" organized over 50 years ago to provide room and board at the lowest possible cost. The residents hire a cook but do all the rest of their own management, cleaning and maintenance; the House itself, at 111 Bay State Road in Boston, is owned by a corporation of Student House alumni, and they take an active role in supervising operations.

Late last spring Student House residents and their alumni corporation agreed to a one-year co-ed experiment starting this fall, after the residents submitted a 50-page report on the advantages and problems—and how to solve them. With corporation approval the proposal went to the Dean of Student Affairs at M.I.T., whose permission came "surprisingly" quickly; "it was easier than we had expected," says one of the original proponents.

So, since September 31, residents have included six girls—two juniors, two sophomores, and two freshmen. All concerned agree that it's no big scene, and almost everyone expects that the House will want to make the one-year experiment a more permanent arrangement.

Student House is small. Its one sleeping area, a dormitory, has been divided, one (smaller) side for girls, the other for boys. One of its two bathrooms now has a "women" sign on the door. But everything else is shared—study rooms, each





of which serve several students, living room, dining room, game room, kitchen. And chores: one of the girls is a dishwasher, another cleans the girls' bathroom, two are on duty as waitresses, and one has the front steps and yard to keep in shape—the same kind of jobs the boys have.

There are no rules, except good sense. Co-eds, the men say, have "toned down" the House. Here is how the residents themselves report it: "People still stagger out of the dorm looking awful, and we still have 2 a.m. bull sessions" . . . "Living with co-eds you learn to think about girls as human beings—a worthwhile adjustment" . . . "I really like living in the house because it's more of a home" . . . "You may get someone to darn your socks" . . . "The strongest reactions have come from the guys' girl friends" . . . "We're learning to live with girls and not for them" . . . "People here use their common sense."

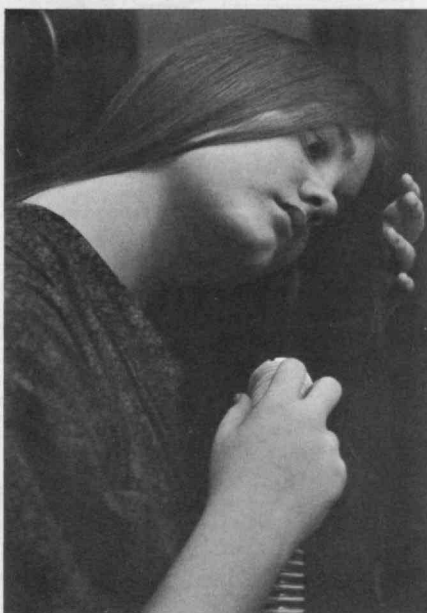
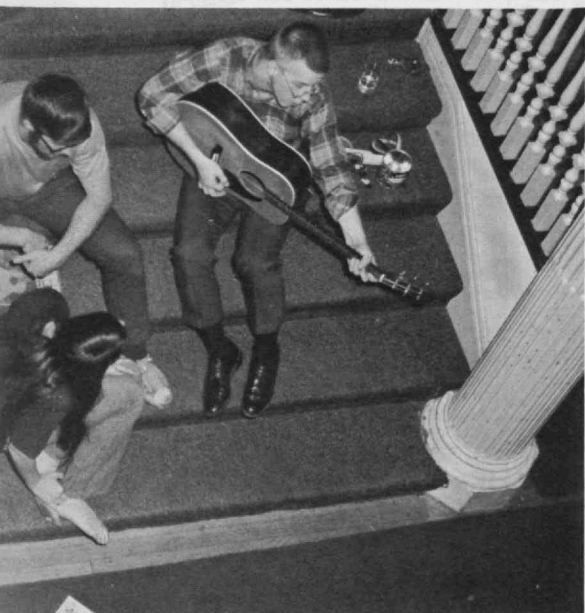
Psychology Grant

The John A. Hartford Foundation, Inc. of New York has awarded a grant of \$162,000 to M.I.T. for research on the functions of the human brain.

The grant provides a two-year extension of support for the Brain Research Unit under the direction of Hans-Lukas Teuber, Head of the Department of Psychology. Earlier grants, for three-year periods, were made in 1963 and 1966.

The program studies brain function primarily through careful assessment of changes in sight, touch and hearing, motor skills and intellectual performance after focal injury to the human brain, whether incurred in warfare or in accidents in civilian life.

By observing the often subtle losses in function after such injuries in previously healthy adults, Professor Teuber and his co-workers are trying to approach two goals at once: they hope to develop reliable tests of brain damage or brain disease, and they want to add to our understanding of normal brain function by seeing how specific abilities are lost or regained in the presence of particular wounds in the human brain.



Kane on M.I.T.

Henry B. Kane, '24
Director of the M.I.T. Alumni Fund,
Emeritus

FEBRUARY 1970



With a few targets
the pro-protesters
should not
pass up

1 Richard Nixon announces presidential candidacy ~1968 	8 Boy Scouts of America, incorporated ~1910 	15 Battleship MAINE blown up ~1898 	22 WASHINGTON'S BIRTHDAY ~Weathermen protest
2 GROUND HOG DAY 	9 Second Term Registration 	16 G. WASHINGTON born today (Mass. only) 	23 U.S. (Establishment) Weathermen respond as only they know how
3 de Valera escapes from British prison ~1919 	10 MARDI GRAS (Fat Tuesday) 	17 Time to plant Brussels Sprouts in Imperial Valley 	24 Snow buries east ~worst in history ~1969
4 Colonials besiege British in Boston ~1776 	11 Sen. Joe McCarthy says 57 Communists work in State Department ~1950 	18 Colonial troops winter at Valley Forge ~1778 	25 Fed up with ALL Weathermen, citizens rise in their wrath
5 Judge Crater still missing (1930 ~) 	12 A. LINCOLN'S Birthday 	19 Thomas Alva Edison patents phonograph ~1878 	26 Students protest Institute meals ~1865, 69, 73, 77... 1970
6 ARBOR DAY in Arizona 	13 13th day of N.Y. sanitation strike ~1968 	20 John Glenn first American to orbit earth ~1962 	27 Reichstag buildings burned ~1933
7 Gen. Eisenhower made allied commander in N. Africa ~1943 	14 ST. VALENTINE'S DAY 	21 Full Snow Moon ~1970 	28 Republican Party started at Ripon, Wis. ~1854

H.B. KANE

Max F. Millikan, 1913-1969

Max F. Millikan, Professor of Economics and Director of the Center for International Studies, died on December 14 after a brief illness; he was 56. Howard W. Johnson, President of M.I.T., said he was "one of our most eminent colleagues, . . . a friend of scholars throughout the world."

Dr. Millikan came to M.I.T. in 1949 as Associate Professor of Economics; he returned after two years' leave of absence to become Professor of Economics and Director of the C.I.S. when the Center itself was formed in 1952. Since then he had a key role in assembling the faculty and research group which has given C.I.S. distinction in many fields of teaching and research; and he himself pursued important studies in the economic growth of developing countries.

Dr. Millikan was widely known as a champion of U.S. foreign aid to underdeveloped nations, and he was concerned as much with the human impact of economic development as with the political rewards. "He believed that sound economics would make the world better," Lucian W. Pye, Professor of Political Science, told the *Boston Globe* in commenting on Professor Millikan's career. "He had a tremendous commitment to helping poor nations."

Dr. Millikan, whose father was the late Robert A. Millikan, Nobel Laureate in physics, himself studied physics at the California Institute of Technology and Yale (B.S. 1935); he then turned to economics, studying at Cambridge University and later Yale (Ph.D. 1941). Following one year as Assistant Professor of Economics at Yale, Dr. Millikan held government posts in the War Shipping Administration and the Department of State from 1943 to 1949.

Professor Millikan had been President of the World Peace Foundation since 1956; he had served on many committees and boards for the government of India, the U.S. Chamber of Commerce, the Agency for International Development, the International Bank for Reconstruction and Development, the United Nations, and the National Planning Association. He was a trustee of the Carnegie Endowment for International Peace and a member of the Board of the Hudson Corporation, and he was the author of a number of books and many articles.

Director of Exhibitions

David A. Kibbey, who has been exhibition manager at M.I.T. since 1967, has been named Director of Exhibitions; he succeeds Professor Wayne V. Andersen, Chairman of the Committee on the Visual Arts, who previously held the appointment jointly with his other teaching and administrative responsibilities.

Mr. Kibbey's paintings, sculptures, prints, and drawings have been exhibited extensively throughout New England; he

taught at the Universities of New Hampshire and Missouri following study at Boston University and the Rhode Island School of Design.

As Director of Exhibitions, Mr. Kibbey assumes responsibilities for the Hayden Gallery and for the M.I.T. art collection.

Educational Council Secretary

M. William Dix, '67, has returned to M.I.T. after two years with the Peace Corps in the Philippines to become Executive Secretary of the M.I.T. Educational Council and Assistant Director of Admissions.

Mr. Dix graduated in metallurgy from M.I.T., and he has been involved in teaching physics to secondary school students during his Peace Corps assignment. He will work with William J. Hecht, '61, to help support the organization of M.I.T. alumni who visit secondary schools to advise and interview prospective applicants to the Institute.

Alumni Calendar

Atlanta—February 3, Tuesday, 8 p.m.—M.I.T. Symphony Orchestra performs at the High Museum.

Boston—February 12, Thursday, 12:00 noon—Luncheon, Aquarium Restaurant, 100 Atlantic Avenue. Speaker: C. Stark Draper. Topic: Early M.I.T.

Cambridge—February 6-7, Friday and Saturday—Conference for Club Presidents, commencing at 4:00 p.m. on Friday: Howard W. Johnson along with other Institute and faculty leaders will join the Friday session and Faculty Club dinner. Saturday meetings will begin at 9 a.m. at the Center for Advanced Engineering Studies, Building 9. The speaker for Saturday's Student Center luncheon is Harold W. Fisher, Chairman of the Alumni Club Advisory Board. Two officers from each Club are invited.

—February 19, Thursday, 6:30 p.m.—The Association of M.I.T. Alumnae's annual student night at the Faculty Club. Speaker: Howard W. Johnson.

Denver—February 5, Thursday, 6:30 p.m.—Dinner, University Club. Speaker: Dr. Jerome B. Wiesner, Provost. Topic: Higher Education: The Role of the Technical University.

Long Island—February 4, Wednesday—The annual beer party: undergraduates home on midterm vacation are welcomed.

Mexico City—March 12-14, Thursday to Saturday—The 21st M.I.T. Fiesta in Mexico. Write the M.I.T. Club of Mexico City, Reforma 116-804, Mexico 6 D.F. or the Alumni Association for reservations.

Miami—March 5, Thursday, 6:00 p.m.—Dinner Meeting, University of Miami Faculty Club. Speaker: Walter A. Rosenblith, Associate Provost. Topic: The Restlessness in Higher Education.



D. A. Kibbey



M. W. Dix

Northern New Jersey—March 20, Friday, 7:00 p.m.—Dinner meeting, Robinhood Inn, Clifton, N.J. Speaker: Dr. Peter P. Poulos, '47, New Jersey College of Medicine. Topic: Heart Surgery.

San Diego—February 4, Wednesday—The M.I.T. Logarithms appear at the regular club meeting.

San Francisco—February 4, Wednesday—The M.I.T. Logarithms appear at the regular club meeting.

Alumni who travel are invited to attend these club meetings.

M.I.T. Club Notes

In Chicago, under the Chairmanship of Karl Van Tassel, '25, all alumni officers holding leadership responsibilities were invited to a Leadership Dinner with James R. Killian, Jr., '26. Included were members of the M.I.T. Corporation, its Visiting Committees and Development Committee, Alumni Association officers and committeemen living in the Chicago area, officers and directors of the Club, chairmen and council members of the Fund, and members of the Educational Council. Many had prior business obligations, yet over thirty attended on November 18 to hear brief reports from the leaders of the Club, Educational Council and Fund organizations and to hear Dr. Killian's report on the Institute.

Many alumni officers met one another for the first time, and many saw their volunteer service for the first time in the larger pattern of Chicago area alumni activity. The success of this Leadership Dinner in coordinating area alumni effort and giving recognition to those carrying responsibilities has encouraged several other larger cities to follow suit. A senior alumni officer with the support of the Directors of the Club may initiate the proposal. It is then developed by the Director for Clubs and the Leadership Dinner Chairman directly, thus adding no further burden to the club's program responsibilities.

Jack W. Dunlap, Chairman of the Board of Dunlap & Associates, a pioneer in applying psychological principles to military and industrial operating problems

and equipment, and James J. Keenan, Jr., Managing Scientist of Dunlap & Associates, an expert in the fields of personnel development, systems analysis and design, and human performance evaluation, explained and demonstrated NEOLOGICS at a January dinner meeting of the M.I.T. Club of Fairfield County. NEOLOGICS is Dunlap & Associates' trademark for a new method of stimulating creativity in business and industry.

"The World of Currier and Ives" was explored at a late fall meeting of the New Haven County M.I.T. Club. The presentation, by Richard M. Stewart, featured a history of various Currier and Ives prints and a comparison with recent photographs of the same New York vistas as they can be seen today.

Undergraduates were the M.I.T. Club of Virginia's guests of honor at a dinner meeting in Richmond on December 27. An effort to bridge the "generation gap" was made by both undergraduates and alumni. William Robinson, '70, presented a skit called "The Transaction," and a lively discussion of current issues followed. Leading the discussion was David Slesinger, President of the Class of '72. Other students participating were John Peers, Jr., Alan Cooper, John Sawyer, Thomas Walton, 3d, Christopher Davis, Lewis Held, Jr., and Douglas Hill. Alumni present included Carson Brooks, '35, Donald Brown, '51, John Dedrick, '48, Donald Gillies, Jr., '41, Christian Grosser, '32, Robert Mills, '33, Dale Spoor, '22, Garland Sydnor, Jr., '49, Malcolm Watson, '34, Robert Whitford, '26, and John Wright, Jr., '47.

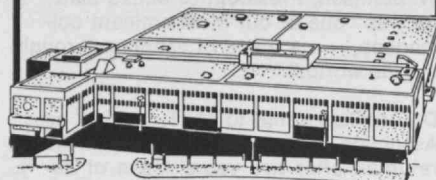
On December 23 the M.I.T. Club of Southwest Florida met in the dining room of Marina Jack overlooking Big Pass where Sarasota Bay joins the Gulf of Mexico. The occasion was to honor Don Wolman, '71, a local lad home from the Institute for the holidays. The fifty-year "generation gap" was no handicap; there were no speeches but just good friendly chatter about what's happening at the Institute. Attending were: William G. Ball, '05, George A. Bernat, '28, H. W. Brown, '15, Clyde K. Hall, '20, A. Ray Holden, '23, Lowell L. Holmes, '23, Andrew T. Johnson, '20, Emory L. Kemp, '15, Chas B. Malone, '15, Bob Robillard, '20, Colonel Granville B. Smith, '18, Lancy Snow, '20, Tollyn Twitchell, '53, Harry A. Wansker, '17, Joseph W. Wattles, 3d, '08.

A number of clubs hold regular monthly luncheon meetings; their schedule follows: Albuquerque, 2d Thursday of the month, Coronado Club, 12:00 noon; Atlanta, 2d Monday of the month, Riviera Motel, 12:15 p.m.; Baltimore, *weekly* luncheons on Mondays, Engineering Society of Baltimore, 12:00 noon; Boston, 2d Thursday of the month, Union Oyster House, 12:15 p.m.; Milwaukee, 2d Tuesday of the month, University Club, 12:00 noon; New York, 3d Tuesday of the month, Chemists' Club; Washington, D.C., 3d Thursday of the month, Brookings Institute, 12:00 noon.

Deceased

Herbert D. Newell, '96, November 19, 1969
 Louis N. Gowell, '00, July 15, 1969
 Herbert A. Sullwold, '07, November 25, 1969
 J. Nye Ryman, '09, November 25, 1969
 Clarence L. Jones, '10, October 8, 1969
 Luke Sawyer, '10, September 17, 1969*
 Milton E. Hayman, '11, October 30, 1969*
 Pierre Drewsen, '12, May 22, 1969
 John C. Freeman, '12, November 24, 1969
 W. Roy Glidden, '12, August 20, 1969
 Hugo H. Hanson, '12, January 9
 Aurelius P. Hornor, '12, October 10, 1969*
 Russell E. Leonard, '13, August 8, 1969*
 Walter L. Whitehead, '13, December 2, 1969
 Leon R. Abbott, '14, January 15, 1969
 Donald de Fremery, '15, November 12, 1969
 Charles M. Ewan, '17, April 20, 1969
 Joseph Gargan, '17, January 1
 Joseph Henry Stagg, Jr., '17, November 18, 1969
 Arthur Grosscup, '20, September, 1969
 Saul Palais, '20, September 21, 1969
 Herman F. Finch, '21, January 5, 1969
 Eliot W. Higgins, '21, November 19, 1969
 William D. Morrison, '21, February 16, 1969
 Kenneth H. Pratt, '21, March 1, 1969
 Glenn Stanton, '21, October 16, 1969
 Joseph H. Flather, '22, November 27, 1969
 Frederick C. Paul, '22, September 27, 1969
 Frank H. Russell, '22, October 20, 1969*
 Stanley M. Ryerson, '22, November 23, 1969
 Stephen A. Days, '23, June 25, 1969*
 Elmer C. Strayer, '23, October 18, 1969
 Kendall B. Castle, '24, November 22, 1969
 Francisco G. de la Macorra, '24, October 27, 1969
 J. Robert Powers, '24, December 5, 1969
 Henry G. Bacon, '25, December 29, 1967
 Forrest B. Kent, '25, December 21, 1969
 William A. Cook, '26, November 25, 1969
 Robert W. Daniels, '26, April 22, 1969
 Charles J. Davin, '27, September 3, 1969
 William D. Birch, '28, December 3, 1969
 John R. Ford, '29, September 1, 1969
 Harold Alcaide, '31, September 10, 1969
 Maurice M. O'Brien, '32, September 5, 1969
 Lorimer C. West, '34, December 6, 1969
 George A. Peterson, '35, September 8, 1969
 Nicholas Lefthes, '36, November 26, 1969
 Herbert O. Brooks, '37, November 10, 1969
 Thomas Norman Willcox, '37, September 21, 1969
 Margaret K. Seikel, '38, July 30, 1969
 Moreton A. Smith, '38, July 30, 1965
 Donald L. Kidd, '42, June 11, 1969
 Carter G. Cook, '43, December 23, 1969
 Enrique Curiel Benfield, '43, November 21, 1969
 Robert H. Wheeler, '43, October 3, 1969
 Robert J. Solari, '47, March 21, 1965
 Charles A. Govatsos, '50, November, 1969*
 Louis Frank, '55, n.d.*
 Frederick L. Schwartz, '59, October 26, 1969
 Timothy N. Sloat, '63, January 3, 1969

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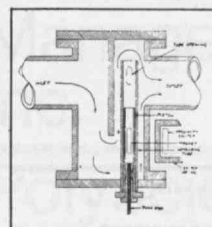
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The tour program covers four areas where those who might otherwise prefer to travel independently will find it advantageous to travel with a group. The itineraries have been carefully constructed to combine the freedom of individual travel with the convenience and saving of group travel. There is an avoidance of regimentation and an emphasis on leisure time, while a comprehensive program of sightseeing ensures a visit to all major points of interest. Hotel reservations are made as much as a year and a half in advance to ensure the finest in accommodations.

Preliminary information concerning the 1970 tour program is presented below. Definitive information and tour brochures will be available shortly.

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SARDIS in Lydia where the royal mint of the wealthy Croesus has recently been unearthed; centers of the Ionian League such as MILETUS and PRIENE; the magnificent marble city of EPHEBUS; crusader castles at RHODES and other sites; beautiful Aegean islands such as DELOS, MYKONOS, PATMOS and HYDRA, as well as CORINTH, EPI-DAUROS, DELPHI, PERGAMUM, DIDYMA, IZMIR (Smyrna), the BOS-PORUS and the DARDENELLES. Total cost is \$1299 from New York. Departure in April, May, July, August, and September 1970.

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Class Review

95

My son gave a very nice luncheon for my 96th birthday. Amazing when I recall I had a notion (why?) that I would die at 42 years of age.

It was a real pleasure to read in the *Boston Herald* that my dear friend Sam Prescott was honored with a chair at M.I.T. in his memory.

Last week I talked via telephone with **Luther Conant**; as a 96-year-old to a 97-year-old all we could do was exchange kindest regards due to hearing difficulties.

My best wishes to President Johnson and the faculty for these trying days with the protestors. I am sure you will come out O.K. Good luck to my Alma Mater!—**Andrew W. Fuller**, Secretary, 1284 Beacon St., Brookline, Mass. 02146

96

This month the mailbag brought a note from Stanley C. Dunning, '17, in which he enclosed a calendar from the Old South Church of Boston. The occasion was the dedication of a new organ in the historic Copley Square church. The following quote is of interest to members of the Class. "The flowers on the Communion table commemorate Mrs. Arthur F. (Hattie Gates) Campbell's generous gift of several years ago, which enabled the Church officers to make the venture with confidence, during this our Three Hundredth Anniversary Year, of installing a new organ." As Miss Gates, Hattie attended many alumni luncheons and in 1960, when she first came as Mrs. Campbell, her classmates recognized her as the class bride by presenting her with a corsage.—**Clare Driscoll**, Acting Secretary, 11 Cliff St., Plymouth, Mass. 02360

98

Bob Lacy was interested in our trip to Mexico which you read about in the January issue. He wrote, "Going to Mexico will be a wonderful experience. I was there about twelve years ago, staying two weeks at Cuernavaca where I saw the date 1523 in the floor of an old building.

Tasco, the silver city, was interesting. Merida and the Mayan Chichen Itza another world!—southern Mexico with the ball court, big temple and enormous tree. We went up Popocatepetl to the divide at 15,000 ft. where there is a monument to the followers of Cortez. The city of Mexico seemed like New York, but taxis only eight cents. You will see it all and rejoice. I had a very pleasant summer with boat trips and parties. One was a French party on July 14, Bastille Day, with three young girls in red caps singing the Marseillaise in French."

Prices have gone up since 12 years ago in Mexico City; taxis are no longer eight cents. I guess the present inflation is world wide, especially in cities. After Mexico, we continued on through the southwest United States seeing places new to us. We're still traveling with our trailer, following the sun across the southern states. I do hope that the first two months of 1970 have been good to you.—**Mrs. Audrey Jones Jones**, Acting Secretary, 232 Fountain St., Springfield, Mass. 01108

01

Class Agent **Edward H. Davis** received a certificate of appreciation from the Alumni Association last fall; certificates were awarded to those whose efforts on behalf of M.I.T. in the 1969 Alumni Fund were outstanding.

Two members of our Class have passed away during the last six months: **George L. Mitchell**, July 27, 1969; and **Austin T. Hyde**, June 4, 1969.

No further news of classmates has come to my attention. Please note my new address.—**William G. Holford**, Secretary, 923 Avenue A, Lake Oswego, Oregon

02

Your secretary sent in no notes in 1969 for two good reasons: there was no news that reached him, and he was busy. From December 1968 to January 1969 he was under the care of nurses around the clock, and his wife was in the hospital or, a nursing home. During the year the Salem home was sold and he is now in a

comfortable old time tourist home. His wife died in December and he is alone except, fortunately, for a son who also lives in Beverly.—**Burton G. Philbrick**, Secretary, Greycroft Inn, 68 Dane St., Beverly, Mass. 01915

03

Reminding us of our presence about the old Rogers building is the passing away of Professor Harry Tyler's daughter. Mrs. Catherine T. Stadie died at her Cambridge home recently. She was our librarian at the end of the main corridor when not engaged in mathematics classes. Her mother was one of the first women to graduate from M.I.T.—Class of 1884. Mrs. Stadie attended the Newton schools and received her degree in social work from Simmons College in 1919. She later resumed her studies receiving an advanced degree from Boston College in 1945. She took a special interest in foreign students and was active in Cambridge community affairs, the Girl Scouts, and local civic groups. In 1957, she married Dr. William Stadie and moved to Philadelphia, returning to Cambridge two years after her husband's death.

After reading the interesting autobiography of our distinguished classmate, **Howard S. Morse**, Course I, of Indianapolis, Ind., in the June, 1968, *Review*, it is our sad duty to note his passing on December 8 after a few month's illness. His long career was devoted to the planning and completion of the huge water system in his native city. Surviving are a son, Daniel P., and a daughter, Mrs. Nelson G. Johnson.—**John J. A. Nolan**, Secretary-Treasurer, 13 Linden Ave., Somerville, Mass. 02143

04

The Class of 1904 is on the road again. In my Christmas mail I received the following note from **George Kaiser** which was greatly appreciated.

"My daughter and I have just returned from a two and one-half months trip to the Orient, by boat to Honolulu, Manila, Taipei (Taiwan), Hong Kong, Kobe-Japan. We flew to Bangkok and admired



Among those attending the Class of '03's reunion in 1968 were (left to right): Mrs. Leroy Gould, Mrs. Lavinia Knox King, Robert J. King, '03, and John J. A. Nolan, Secretary of '03. Mr. King's autobiography appeared in last month's issue.

the wonderful elaborately ornamental temples. Flying to Sidney with a stop-over in Singapore, we took the S.S. *Monterey* back to San Francisco, with a brief stop at Fiji Islands and American Samoa. We rented a car during our three weeks stay in Japan. I was surprised at the changes and growth of the various cities and improved highways since my previous visit 43 years ago. Japan has become thoroughly westernized."

I understand **Frank Davis** made a trip to his lodge in the north country and bagged his deer for the season. Nice work Frank.

I am sorry I cannot show you a picture sent to me by our southern representative, **Amasa Holcombe**. It showed four generations of his branch of the Holcombe family made from snap shots taken last June at Stone Harbor, N.J. at a family reunion held at the beach cottage of his son Marshall, M.I.T., '36. The card reads: "Besides Marshall and me the others are his son Robert Swaine Holcombe and grandson Robert Swaine Holcombe, Jr. I now have five great-grandchildren upon whom to pin my hope of immortality and all are doing well. Marshall has recently built a home at Naples, Florida, to retire to, and Martha and I spent Thanksgiving there, where we were joined also by my daughter Priscilla and her husband, recently returned from Jerusalem to Washington for duty in the State Department."

I want to take this opportunity to thank **Fred Goldthwait**, Secretary of Class '05 for his many acts of kindness and help extended to me since I have been attempting to write the '04 news notes. I hope to thank you personally Fred when we meet in June 1970. Best wishes to you always.—**Eugene H. Russell**, 82 Stevens Rd., Needham, Mass 02192

05

If my classmates can't or don't furnish me any news, I have to furnish some of my own. Ruth and I announce the marriage of our daughter, Lucy, to Norman R. Anderson of Greensboro, N.C. Lucy and Norman were in high school at the same time in Melrose, Mass. I escorted

the bride down the aisle of the First Unitarian-Universalist Church, Springfield, Mass., on December 27 without the benefit of wheel chair or "walker." It was nice, however, to be holding onto the arm of the bride. Lucy's address, for the benefit of those who knew her, is Mrs. Norman R. Anderson, 1614 Forest Valley Road, Greensboro, N.C. 27410. This was Ruth's fifth formal church wedding and "putting it on" at a distance of 200 miles, in less than two months, was quite a task (happy), requiring commuting several times. What did I do? I acquired four very fine new grandchildren, 9 to 19, in a very few seconds.

Through the Alumni Association I received a change of address—**Ralph N. Whitcomb**, The Springs, North Stoke, Oxford, England. A shock, because through inability to get a response from him for a period of years, we had crossed him off our list. I had tried to find him at the address he had given long ago with no success. I wrote Ralph, who had become a citizen of England, nearly two months ago at the new address—no response. Perhaps one of you who knew him well could get one.

No other news except that **Edward J. Poor**, Course VI, is back in Florida for the winter. Address: 2216 North Atlantic Blvd., Fort Lauderdale, Fla. 33305.—**Fred W. Goldthwait**, Secretary, Box 32, Center Sandwich, N.H. 03227; **William G. Ball**, Assistant Secretary, 6311 Fordham Place, Bay Shore Gardens, Bradenton, Fla. 33505

06

All in the same delivery on November 8, and just two days before these notes were due at the Alumni Office, came three very welcome and interesting letters. Our new Class President, **Stewart Coey**, enclosed a "Memoir"—of the American Institute of Consulting Engineers—about **Sherman Chase** which had been sent to him by an old friend. Said memoir did not add much to the "career" which was included in the December notes. Stew and Betty may move to our area. Their daughter and son-in-law, Norman Dalrymple, expect to move to Natick soon where Norman has a new job. The

Coeys have been living with them in Wilmington, Vt. and will probably continue to do so, if and when they move.

Robert E. Cushman, my good correspondent in Portland, Ore., reported the death on October 10 of his wife Ruth in a nursing home where Bob had visited her almost every day for ten or more years. Also surviving is his son by his first wife. Mrs. Cushman was a graduate of Johns Hopkins School of Nursing and of Columbia University, and was one of the first nurses to volunteer for duty in France in W.W. I. She was in the group that received a citation in France from the U.S. Army. Born in Acushnet, Mass., she had served for seven years as a children's welfare consultant in New Orleans, was a nurse in several states and head nurse in Manchester, N.H. when she married and retired. Thinking back about old times, Bob was reminded of the major incentive that sparked his ambition to enter M.I.T.—it being an uncle, Harrison I. Cole, M.I.T. '91 M.E., now living in N. Pembroke, Mass., who furnished that inspiration. Last August when he was 99, he wrote to Robert: "I am enjoying life as I am fortunately free from aches and pains and the world looks good to me."

Bob sent his best regards to us and to any classmates you may see from time to time. Now that Jim and Sherm are gone and **George Guernsey** lives year-round in Florida, I rarely see a classmate, but here's hoping the Coeys move to Natick. Because he was living in such an out-of-the-way place—Tryon, N.C.—**John Norton** had not heard of Sherman's death till a short time ago. He commented on Sherman's highly successful career having "made a name for himself as sanitary engineer both here and abroad and will be a great loss to his profession. I was interested when Sherm moved to Auburn-dale and bought a house a short stone's throw from where I was brought up until I was 15 years old. I lived in that town also while I was a student at M.I.T., and Margaret and I lived there for several years after we were married. I have not been back for many years." Jack would find that much of that suburb has not changed a bit, except along the route of the Massachusetts Turnpike. He allowed that he and Margaret are pretty well—for oldsters.

Through the Fund office I learn that **E. B. Bartlett** is 87 years old. He has 13 in-laws, 28 descendants and still goes to Arizona in the winter—from his long-time home in Milwaukee.

You gourmets might be interested in the "Supper Bill of Fare" of a Greek letter fraternity to which an uncle of Marion's belonged, for a dinner held in Schenectady in January, 1872. It included: soup; fish; roast, 5 kinds; game, 6 kinds; jellies, 4 kinds; pastry, 8 kinds; ices, 2 kinds; confectionaries, 8 kinds; fruits, 4 kinds, with chocolate and coffee. Phew! I can't eat my supper.—**E. B. Rowe**, Secretary-Treasurer, 11 Cushing Rd., Wellesley Hills, Mass. 02181

09

We regret to begin these notes with a report of an accident to **Art Shaw** which is described in a note received from him on October 20. "I have been at the Newton-Wellesley Hospital since October 2 when a ladder, with me on it, fell while I was pruning an apple tree—one of my customary fall activities putting my yard in shape for the winter. This time I'm ashamed to say I neglected certain well known principles of static forces and friction factors. I sustained a compression fracture of my second lumbar vertebra. Luckily no damage to the spinal cord. I am now in a body cast and am learning to get out of bed and back in and to walk again after over two weeks horizontal. I hope to go home within a week. It is uncertain whether we can take off to Florida as early as our usual late November departure but we will get there sometime during December, I am sure. Sorry my contribution to class notes is not more cheerful."

Muriel and I visited Art at the hospital shortly after receiving the note and found him up and exercising by walking along the hospital corridors and up and down short flights of stairs in the hospital, in order to overcome lameness resulting from the accident. On November 9, the day before this copy was due at the Review office, we called Art. He was able to walk around readily, could get in and out of the car, and the cast was due for removal in about two weeks. He and Betty are planning to leave early in December for their winter home on Longboat Key in Florida. They will fly rather than drive as usual. The Class wishes Art a continued and early recovery.

In the December Review we told of the interest which Blanche (Mrs. **Lewis**) **Johnson** of Rockland, Maine, maintains in the Class and that she made every effort to attend our Sixtieth. At her request we sent her a copy of the October/November

class notes devoted almost entirely to the reunion. She replied with a note beginning, "It seems that everyone calls you 'Chet', so you call me 'Blanche'." She was delighted with the news of the reunion and is most grateful that she is kept informed of class activities. She was interested in the status of **Elliot Q. Adams** and we have sent her a copy of the December notes in which this information appears.

Professor (Emeritus) John Babcock, '10, is chairman of his 1910 reunion committee. For possible guidance in making their reunion plans, John wrote to Art requesting information relating to our Sixtieth. Also, your secretary met him at the 1969 Alumni Officers' Conference and volunteered to send him our plans, announcements and the description of the reunion as it appeared in the class notes. He has replied stating: "Thanks for your letter and enclosures. They reached me just before I went to Cambridge for a dinner meeting of all chairmen of class reunion committees for classes holding 'quinquennial' reunions in June, 1970. The material you sent was of much interest and will help our 1910 committee in planning its 60th reunion. I was glad to see you at the recent Alumni Officers' Conference." Until he retired, John was Professor of Civil Engineering at the Institute. Our Class wishes 1910 a most successful 60th reunion.

Please note the postscript in Art's September letter to the Class requesting that "some bit of personal gossip" be sent to the Secretary for class notes. We are told that most classmates turn first to these notes when they receive the Review.—**Chester L. Dawes**, Secretary, Pierce Hall, Harvard University, Cambridge, Mass. 02138; **George Wallis**, Assistant Secretary, Wenham, Mass. 01984

10

The following notes have been received: **Luke Sawyer** passed away September 17. The following is an editorial from the *Beaver Falls News Tribune*: "Sawyer had retired from B & W in 1954, after a 43-year career with the firm, and was serving as a consultant at the time of his death. He had a long association with Providence Hospital and later with United Hospital, after the merger of Providence and Beaver Valley hospitals. He had served as a director of Providence since 1948 and as president of its board from 1951 until the merger. He was president of the merged board at the time of his death.

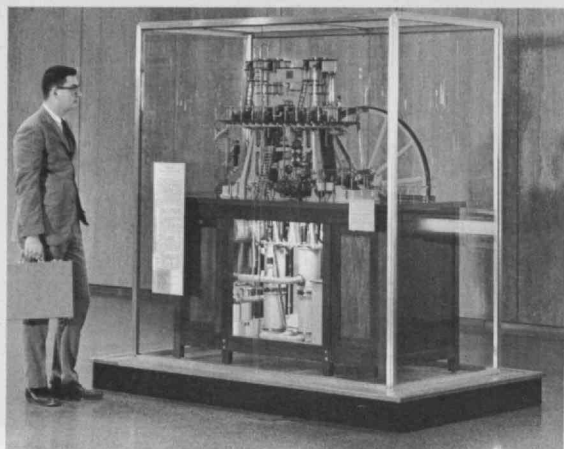
"The community will miss Luke E. Sawyer. He was an integral part of it for 50 years and his name became synonymous

with two of the community's key organizations—Babcock and Wilcox Tubular Products Division and the then Providence Hospital. He served the first for 43 years eventually becoming executive vice president of the company. It was under his direction that B & W first began the expansion program that has created the several thousand jobs for Beaver Countians in the past decade. For the hospital, he served, 'beyond the call of duty' for 21 years giving his time, effort and devotion to both Providence Hospital and then, later, United Hospital. During that time he was a close associate and trusted friend of Sister Irenaeus then supervisor of the hospital for the Sisters of Charity. In addition to these, he involved himself in work with the schools and within the community. In all he gave unstintingly of himself even after several severe heart attacks. Of his 82 years he gave 50 . . . to the Beaver Falls area. He passed through this life but once, but gave in that brief moment what for others might take two lifetimes."

We had a note from Mrs. **Clarence L. Jones** that Clarence passed away October 8.

Frederick T. Crossley: "At long last, I will reply to your notice of March 31 last of proposed celebration of our 60th reunion in June 1970. It would be a pleasure of course to attend, but unfortunately my health is not robust enough to attempt to be present at such a hilarious and exciting occasion. I know had the event been held in 1969, I should not have been present. But of a present census of 125 living members of the Class, I expect there will be numerous ones, living in the metropolitan area, who will attend. Since my wife died in Hartford some eight years ago I have returned to the family home to live with my two sisters, both younger than I. While not confined to the house, and still drive, that is only rarely to a nearby track or country area. As the Reunion Chairman will not be burdened with many, if any, messages to me, I am enclosing, nevertheless, a small check and hoping all the Octogenarians attending will have a most merry and zesty time of it."

On November 7, Jack Babcock called a meeting of the 60th Reunion Committee. Attending this committee meeting were Ralph Horn, Russell Hastings, John Gray, Bob Burnette, Herbert S. Cleverdon and Jack Babcock. The minutes of this meeting and preparations for the reunion will be in your hands probably before you receive this Review. However, further notice will be in the mail in the early spring.—**Herbert S. Cleverdon**, Secretary, 112 Shawmut Ave., Boston.



This scale model of an 1890 steam pumping engine, built by Harry Catching, '12, is on exhibition in the National Museum, Hall of Exhibits, Washington, D.C.

11

The thing foremost in my mind as this is written (January 2) is the death of my wife, Alma, after a brief illness on December 18. Those of you who attended the 50-year reunion will remember her as the lady who got you all together and made the party go. Her death came just 12 days after I returned from the hospital from my second cataract operation. The doctor tells me my eye has made a remarkable recovery and I will have prescription glasses in a few days.

Last month I had a very fine letter from President **Howard Williams**. Although he sold his business about a year ago, he still retains an office and secretary to look after his many interests and says he is busier than ever. He is breeding and racing horses and spends much time at the ranch and race tracks. He says he has some "good winners," expects to win some stake races in the next few years and that it is a real business.

Howard serves on a number of boards of directors including Early California Industries, Brown Derby Restaurants, Thomas Deegan Company of New York, the Salvation Army and Boy Scouts. He has just been made Chairman of the Board of Trustees of Pitzer College and is a member of the Development Committee of the Corporation of M.I.T. Last June Howard drove east to attend the wedding of his daughter, the graduation from Harvard of his son and to celebrate his 80th birthday with his whole family.

On November 1, I received the very interesting memoirs of **Harry Tisdale** of Fort Myers Beach, Fla. and will put them in next month's notes. In an accompanying letter he told of his efforts to safeguard his boat from hurricane Laurie in a torrential rain and of returning from a concert in Fort Myers in another downpour. . . . In a late October letter from **Minot Dennett** he had this to say about his new abode which he occupied about December 1: "My new apartment is on Bocca Ciega Bay, right where the inland waterway meets

the bay. It looks as though the fishing would be good there, and I hope to take advantage of it. Also, I have a niece and her family and other friends in that area. The apartment will be ready for occupancy in November and I am going over to St. Petersburg soon to take another look at it."

Along with their contributions to the Alumni Fund the following news: From **Irving W. Wilson**: "I continue to enjoy good health and an active life. Warm regards to all." From **Harold E. Babbitt**: "Still going strong." From **Lloyd C. Cooley**: "Finally retired and bought a new house in the Village Green section of Sarasota. I plan to attend local alumni meetings. Sorry that I missed seeing Stu Copeland before he passed away."

Some changed addresses: Minot S. Dennett, Apt. 45, 523 Plaza Seville Court, Pleasure Island, Fla.; Philip L. Caldwell, 1612 Casey Key Rd., Nokomis, Fla. 33555; Edward Sisson, 60 Longwood Ave., Brookline, Mass. 02146.

I have to report that **Milton E. Hayman**, 1216 Farmington Ave., West Hartford, Conn., died on October 30. Milton was born in Taunton, prepared for Tech at Taunton High School and graduated in architecture. He lived near Hartford most of his life and was a successful self-employed architect.

I have received word that **Calvin P. Eldred** passed away on July 31. He was born in Minneapolis, Minn., in 1885 and prepared for Tech at Coburn Classical Institute in Waterville, Maine.

A letter from **O. W. Stewart** replying to a note from me regarding a contribution to the Alumni Fund said that the Stewart's 16 grandchildren are occupying a liberal portion of their interests. . . . **John Scoville**, who sent me word of Milton Hayman's death, says he is still carrying on and works a few days a week.

At Christmas time, **Curtis Kinney** sent me a booklet, "Notes and Quotes from the Desk of Curtis Kinney," containing many original sayings; it was really very good.—**Oberlin S. Clark**, 50 Leonard Rd., North Weymouth, Mass. 02191

12

DO YOU REMEMBER the poorly ventilated chem labs of our Tech days? I recently heard a story concerning Cornie Duyser which I am repeating at the risk of losing his friendship. It seems that a group of Course X men went to see an early movie show on Boylston St. directly after classes. Cornie had spent the afternoon in chem lab, and his raiment had absorbed an excessive amount of noxious vapors. Shortly after arrival in the theatre, an awful odor permeated the atmosphere, and those in the vicinity, on locating its source, protested vigorously. To his humiliation, Cornie was requested to leave the premises. This incident recalls similar protests from my dear wife in days past, after I had spent a day in a sulphite paper mill or some plastics plant using formaldehyde.

And speaking of odors, **Paul Lawrence** recalls that one evening he came home to his room in Tech Chambers rather late and found a student taking off his clothes on the front sidewalk. He had been out to visit a young lady at Wellesley and had encountered a skunk, so had had to ride home on the back platform of the train. Paul writes, "I never did find out whether or not his date was also involved."

I, too, have a 1911 skunk story. I was loaned the use of a friend's summer cottage on the cliffs at Scituate. On starting to open the screened front door, I encountered one of those animals, who in some way had become pinned in between the door and the screen. You all know the old story of the mother skunk, who told her offspring, "Let us spray!" To my dismay, this one had learned his lesson well.

Harry Catching, Course I, writes from Lexington, Ky., as follows, "A fellow who has put down as many dry holes as you have, five by your own count, deserves a wet well, but I can promise only a little old pumper. After graduation, I followed the not unusual pattern of being a tramp engineer for a few years, before and after World War I, which invited my attention for a couple of years. After this, for some twenty years, I was

the firm of W. B. Catching & Company, general building contractors, in Lexington, Ky. I quit this endeavor only when it became evident that even an outhouse could no longer be built without maintaining an office force. Gone were the good old days when all that was needed, clerically, was a check book in one hip pocket and a time book in the other. So it seemed better to lease the business to others.

"There are two accomplishments in my life of which I am most proud. First and foremost was when I induced Doris to marry me, and then to put up with my idiosyncrasies for the many years since. The second came about through a hobby in which I became interested, the making of scale operating models of steam engines. One could say that in this I got wet all over. It so happened that the National Museum of History and Technology had selected the design of a Mr. E. D. Leavitt, Jr. as representative of the development period of the steam pumping, circa 1890. He had designed a compound engine for the City of Louisville Water Department, which was unusual in that it had a steam piston stroke of 12 feet and a flywheel 36 feet in diameter. The Water Company had preserved the original construction and erection drawings, which they made available to me. From these I produced the model shown in the photo, which was about 90 per cent correct in detail at a scale of one inch equals one foot, and is operated on compressed air to simulate steam. The Smithsonian Institute learned of my model and expressed a desire for it. It is now entered in their records as a presentation from Harry H. and Doris S. Catching. My wife certainly rated equal mention for her years of suffering uncomplainingly while I worked and littered up the home basement which I used as a machine shop.

"As a result of this donation, which has now been on exhibition in the National Museum, Hall of Exhibits, Washington for several years, I was recently pleased to receive from the Smithsonian Institute parent organization, a notice of my appointment as an Honorary Research Associate in the National Museum of History and Technology. The citation states, 'Your superb model of a steam

pumping engine has become a prized part of the Museum's collection, and a valuable medium of public education.' I am now working on a model of another unusual engine located in the Chestnut Hill pumping station of the Boston Water Works (MDC). Although the Louisville engine has been scrapped, the Boston engine is intact, though out of service for the past 25 years." Congratulations, Harry—a most unusual and very interesting hobby!

Jack Connolly, Course I, has written us from Ponte Vedra Beach, Fla. as follows: "After graduation I tried my hand at structural engineering, first with the American Bridge Co., then for short periods with the C&O R.R. and the B&O R.R., as well as the Interstate Commerce Commission, on railroad valuation. In 1916, I entered the employ of the Mexican Petroleum Co. as a construction engineer, building ocean terminals. This led to sales work, developing fuel oil outlets along the Atlantic seaboard and various gulf ports. In the twenties, after a brief period of drilling oil wells in the Smackover area of Arkansas, my sales efforts were broadened to include the marketing of other petroleum products, notably gasoline.

"In 1933, I joined Standard Oil Co. of New Jersey as manager of fuel oil sales, a position which later developed into the broader field of general petroleum products. Here I was engaged until 1954, when as a result of failing eyesight, I decided to retire, serving as Deputy Coordinator of World Wide Sales. I soon moved to Florida, but not content to remain idle, I became associated with a small fuel oil distributor in Jacksonville where I am still active in an executive capacity. In 1956, we built the home in Ponte Vedra where we now live.

"In 1924, I married Hazel F. Reilly of Williamsport, Pa. We have three children, one son living in Jacksonville, a daughter in Clearwater and another daughter in Moorestown, N.H. There are 14 grandchildren. Our health continues to be good and we look forward to many more years of pleasant Florida living."

Randall Cremer is "not at all well" according to a letter received from

his good wife, Dorothy, in October. At that time he was visiting their son, George, M.I.T.'39, in San Diego, Calif. We expect to hear from him later, however, and hope he will soon be feeling much better. Dorothy also writes that **Page Golsan** and his wife visited them at their winter home in Mallorca while on a tour through Spain. The Cremers repeat their invitation to all classmates to be sure to visit them if their travels take them to the island of Mallorca. The address is Ses Voltes Blanques, Genova, Parma, Mallorca, Spain.

A letter from **Johnnie Noyes**, our Class Estate Secretary, tells of a visit of several weeks to New England last summer at which time he and Caroline spent several happy days in Andover, Mass. with Marjorie and **Cy Springall**. Cy is still active as a board director of the local bank, and Marjorie keeps busy with her many community interests. They are quite thrilled to become new grandparents. The Noyes spent most of their time visiting with their six married children, one family living in McLean, Va., and the other five in Texas towns, including San Antonio, Edinburg, Houston, Corpus Christi and Bryan. The Noyes tribe, some 20 strong, were all together for Thanksgiving in Bryan, at which time they attended the big football game between Texas and Texas A&M.

Bob Wiseman, who attended our Alumni Day luncheon in Cambridge this year, has sent a note saying he is now living a very quiet and unexciting retired life with his sister in Arlington, Mass. . . . **Jack Lenaerts** and Marion have moved from their beautiful home in Venice, Fla. to a nearby apartment at 512 West Venice Ave., 33595. . . . **John Selfridge** sends a card advising of their move from San Francisco to an apartment located at 501 Via Casitas (Apt. #512), Greenbrae, Calif., 94904.

Paul Lawrence, Course X, of Gary, Ind., sends us the sad news of the passing of his wife, Edna, last August, to whom he had been married since 1914. She was a Wellesley 1912 graduate. Paul is selling his home in Gary, but his future plans are as yet indefinite. The sympathy of our Class goes out to him in this great loss.

We are saddened to learn of the passing of **Francis Kingsbury** in Medfield, Mass., on September 11. He is survived by his widow, a son who lives nearby, and a married daughter in San Diego. There are four grandchildren and one great-grandchild. We have sent our sympathy to Mrs. Kingsbury in the name of the Class.

Another classmate, **Aurelius Hornor**, Course VI, died in Carlisle, Pa. on October 10 after a brief illness, as reported by his son, Aurelius Hornor, Jr., '36, to whom we have expressed our condolences. Aurelius had written us his life story, published in the January 1968 issue, at which time both he and his wife were in good health and active about their country home and large fruit and flower gardens. Mrs. Hornor passed away suddenly in January 1968, however, and since then he had lived alone.

Ham Merrill writes from Bridgeport, Conn., "I would look forward to attending a 1970 reunion on Cape Cod and think it's a great idea to get together while we can. As for me, I'm feeling fine except for a touch of arthritis which precludes golf, but not swimming, bridge or cocktail parties. Somehow, I've acquired a great-grandson and a great-granddaughter. Summers I spend about five months at Orleans, Cape Cod, in the house where we were married in 1921. During the winter, I'm still busy at the University of Bridgeport, where I raise money and serve on five committees. We plan to spend February and March in the South Sea Islands including Australia, New Zealand and Hawaii."

We are concerned about **W. C. (Bill) Lynch**, Beverly Hills, Calif., who has always been an active alumnus, attending nearly every reunion. We have written him six times in the past two years but have received no reply. I have heard a rumor that he has been ill for some time, but cannot confirm it. If any member of the Class has, or can obtain any news regarding Bill, please let me know.

By the time this is published, we expect to be located in our winter abode in Bradenton, Fla. The mailman will forward all of your contributions, however, so please keep them coming. This means any bit of current news. It's the number of items from many of you that makes the column interesting. We have talked by phone with **Jay Pratt** today (November 9) and he is satisfactorily recovering from his heart attack and hoping that the doctor will permit him to leave later for his usual winter sojourn in Acapulco. He will be pleased to receive letters from classmates during his convalescence.

So far we have heard from but five men, evidencing interest in a 1970 Cape Cod reunion, but feel certain that there are many who would attend. Won't you take a moment to write. Time is flying!—**Ray E. Wilson**, Secretary, 304 Park Ave., Swarthmore, Pa.

19081; **Jay H. Pratt**, Assistant Secretary, 937 Fair Oaks Ave., Oak Park, Ill. 60302

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We hope that this new year of 1970 will be happy and enjoyable to you and yours. During the month of October, there were several programs for the officers of your Class. On October 9, 1969 at the Union Oyster House the M.I.T. Club of Boston held a very instructive luncheon; the guest speaker was State Representative George L. Sacco, Vice-chairman of the Ways and Means Committee. At one of the tables a group of the "Old Timers" enjoyed the lunch and each other's company: Stanley G. H. Fitch, '00, Course X, of Cambridge; J. Warren Wattles, '08, Course II, formerly of Canton, now of Weston, Mass. and Venice, Fla.; Charles Thompson, '13, Course X, of West Newton; James H. Evans, '23, Course VI, Wellesley Hills, Mass.; and George Philip Capen, '13, Course X, Canton, Mass.

The Boston Club meets monthly on Thursday at noon at the Union Oyster House. This monthly meeting is attended by a hundred or more alumni with representation of M.I.T. classes from 1900 to 1969. The officials of the Club have provided a very interesting program for 1969-70, which will include on March 12, 1970, Gerald W. Blakely, Jr., son of Gerald W. Blakely, Class of 1914. He is the President of Cabot, Cabot and Forbes Co., one of the outstanding developers of the country. Alumni in the greater Boston area should join the Boston M.I.T. Club by addressing their requests for applications to M.I.T., Room E19-422.

On October 23, 1969 the M.I.T. Club of Boston held an evening meeting at the Boston Museum of Science which presented a very interesting program and an excellent buffet. Wives and children of alumni attended and took part in very simple scientific demonstrations; they viewed various historical scientific exhibits (some static and some live). The Hayden Planetarium was exotic and rather eerie, with excellent explanatory remarks from D. Reid Weeden, Jr., '41, President of the museum, Larry Schindler, '61, and Mr. Bradford, Director of the Washburn Museum.

Your President **Charlie Thompson** and **George Philip Capen**, Secretary, attended the dinner and monthly meeting of the M.I.T. Alumni Advisory Council followed by a report on the so-called "Pound's Panel" (appointed by our President Johnson) which was narrated by William F. Pounds, Chairman of the panel of 22 members which included M.I.T. faculty, alumni, students and laboratory staff (selected from the Instrumentation Laboratory and the Lincoln Laboratory). (For a report on the panel and its recommendations see *Technology Review* for June 1969, pp. 72A, B, and December, p. 96.)

An article in the *Boston Herald Traveler* of July 28, 1969 was headed by the following title: "Independent Mind Put Lady Physicist In Thick Of Men's Scientific World." The lady in question is Dorothy W. Weeks, '23. She was a sister of our classmate, the late Robert W. Weeks. Dorothy received two master's degrees, one from M.I.T., and one from Simmons, a Ph.D. from M.I.T., a fellowship from Wellesley College and a Guggenheim Fellowship in 1949. She now teaches physics at the College of the Sacred Heart in Newton and does research in spectroscopy at the Harvard College Observatory. We of 1913 salute you Dorothy, for your wonderful accomplishments in "equal opportunity" research in science and technology.

Edgar H. Weil wrote to your Secretary saying: "It's a good many years since I have seen you. It was nice to receive your congratulations on our anniversary. Many thanks. I hope we will meet again one of these days." . . . We have received a note from **Larry Hart** enclosing his dues (even before the bills were sent out). So Larry is number one on our list for 1969-1970.

Several notes have been received through the Alumni Fund Office. A short note from **George W. Bakeman** informs us that he has retired. . . . **Bill Mattson** reports: "We have had an interesting but quiet summer—several house guests, auto trips in the Colorado mountains; enjoying excellent health." . . . And from **Allen Brewer** we learn that the first eight chapters of his current series of articles under the title of "Lubrication: Management Responsibility" have now appeared in *Industrial Lubrication* which is published in England. He says: "I am now working on the second section of companion articles which will be directed to specific industries. After completion of publication of these latest articles it is hoped that the publishers will bring them out in book form as a textbook for management and lubrication engineers." Bill closes with news that Maurine is now recovering from a recent operation.

We are very thankful for the letter written by **Gordon Howie** to John J. A. Nolan, Secretary and Treasurer, Class of '03. Gordon writes: "It was good of you to give the newspaper clipping which referred to me to our mutual friend Francis MacDonald. . . . Thank you for it. . . . As you were in the Class of '03 you must have known a member of that class, Isaac T. Haddock. He was my boss in the Cambridge Gas Company, and later, when he became V.P. of the holding company, the New England Gas and Electric Association, I advanced into his position becoming V.P. and G.M. of the Cambridge Gas Company."

A letter was received from Mrs. Dorothy C. Leonard stating that **Russell E. Leonard** passed away August 8, 1969 following a long illness. We immediately sent a sympathy card to Russell's family on behalf of the members of the Class

of '13. A subsequent letter was received from Mrs. Leonard, 2600 Hendrickson Ave., Oceanside, Long Island, N.Y. 11572, and we quote: "Thank you for your thoughtful and kind message of sympathy. You said you would appreciate further details on Russell's career which I will endeavor to relate to you."

"Russell retired in 1955 after 40 years in the telephone business. He was a transmission engineer with the A.T. & T. at 195 Broadway, New York. A 1913 graduate of M.I.T., he spent two years on an M.I.T. assignment before becoming a telephone man. His specialty at A.T. & T. was handling electrical coordination assignments involving telephone, power and railroad facilities. He participated in an electrical coordination survey and study of Montana. The survey, lasting a year, included circuits on the route now used by the Northern transcontinental line.

"He was a registered professional engineer, a life member of the Association of Industrial and Electrical Engineers, and a member of the U.S. Power Squadrons. His hobby was color photography and his collection of photographs includes many views of the less-accessible parts of Colorado, Wyoming and Montana. He is survived by his wife, Dorothy, whom he married in 1925 and two sisters who reside in Massachusetts. I hope I have answered your request for information regarding Russell's career. My regards to you."

Again, we must report the death of one of our active and cooperative friends as well as classmates. **Arthur Lawrence Brown** died suddenly on October 30, 1969. To quote a newspaper clipping, A. L. Brown "who retired in 1956 after 35 years with the Factory Mutual Fire Insurance Companies, died unexpectedly Monday (October 30) in Newton Wellesley Hospital. He had been chief engineer of the engineering division of the insurance firms. . . . a World War I Army veteran, Brown lectured on fire protection at Northeastern University the past two years. Since his retirement, he had also served as a consultant to Factory Mutual and to the Nuclear Energy Insurance Committee.

"He was an honorary life member of National Fire Protection Assn., a charter member of Society of Fire Protection Engineers and former president of its New England chapter. He was also a life member of American Ordnance Association, a registered professional engineer of the commonwealth and was a member of American Society of Mechanical Engineers and of Arlington Street Church. He leaves his wife, Mrs. Emma (Steves) Brown, and a brother, Carroll W. of Rye Beach, N.H."

To A. L.'s wife, Emma, all of us of the Class of 1913 extend our most sincere sympathy, especially those who have been closely associated with him over these many years.

All of us of the Class of '13 are cordially invited to attend the 22nd Annual M.I.T. Fiesta in Mexico City, March 12 through 14, 1970. Our friend and Chairman of the M.I.T. Corporation, James R. Killian, Jr., '26, will be the guest of honor. For further information write the M.I.T. Club of Mexico City at Reforma 116-804, Mexico 6, D.F.

A note has been received from Mrs. **John B. Woodward, Jr.**, and we quote: "Please express my appreciation to the members of the Class of 1913 M.I.T., for their thoughtfulness at this time."

From the total amount of 161 bills for class dues sent to classmates, 84 were returned, which was very gratifying even though several were returned marked "unknown at this address" and several deaths were also reported. Responses to the four-question survey included with the bills are summarized as follows: 1) Do you favor the lowering of entrance standards?—67 no, 1 yes, 16 not voting; 2) Do you favor students being represented on committees to establish guide-lines and policy-making standards?—44 no, 22 yes, 16 not voting; 3) Do you favor further priority of humanities over scientific and engineering subjects?—60 no, 2 yes, 22 not voting; 4) Do you favor M.I.T. selecting a greater percentage of ethnic groups for admission to our Institute than now exists?—54 no, 5 yes, 25 not voting.

A newspaper clipping has been received stating that our James R. Killian, Jr., Chairman of the M.I.T. Corporation has been chosen "The Man of the Year" by the New England Council, an association of business, labor and other New England organizations. Congratulations to you Doctor. We are very proud of you.

Thanks to each and every one of you of the Class of 1913 for your expressions and opinions in these troubled times. Our President Johnson, the Administration, and the Faculty need your advice and faith in the future of M.I.T. Until next month.—**George Philip Capen**, Secretary and Treasurer, 60 Everett St., Canton, Mass. 02021

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We like to receive simple notes about the doings of our classmates such as the one from **Estus Magoon**, particularly when they suggest peace and quiet, and while there are rumblings in many scholastic surroundings that seem to portend evil of sorts, Estus writes: "Dear Mr. Secretary: We read the class letters with interest and I send a small check to M.I.T. each year but I seldom write.

"I celebrated my 77th birthday on February 14th and am still in good health and reasonably active. This spring and summer my wife and I made a very interesting tour of Egypt and several European countries seeing some of the places

where I worked many years ago, we also enjoyed revisiting the Bible lands—later we spent three weeks in the Blue Ridge mountains of Virginia with friends and relatives. My wife had her birthday party the day the Astronauts walked on the moon, July 20th. We are looking forward to spending Christmas in Texas with our grandchildren and their parents. My warmest regards to all Fourteeners."

And **Lin Faunce** takes his pen in hand November 3, 1969: "Dear Herman: The enclosed clipping from our local paper reminded me that I went to a dinner meeting of the Hartford M.I.T. Club a couple of weeks ago and heard V.P. Kenneth Wadleigh report on present conditions at Tech and was able to tell of my knowledge gleaned at our reunion which seemed to appeal to the assembled 30 or so more than Wadleigh's generalities. But these activities begin to affect me more and more. I've always been proud of Tech and felt that an unusually sensible and responsible type of boy went there. Wadleigh told us that 4 out of 100 only were really associated with Tech—but why do we have to put up with trespassers? I'm beginning to get mad like Ray Dinsmore did in Kresge Auditorium when he hollered 'Sit down and shut up!' at one of the speakers and you know Ray is one of our quiet dignified ones.

"Well, now I've got that off my chest how are you and Dorothy? We have been practising this past week of rain on how to stay in for the winter but can't say we've enjoyed it. Hope you folks know how to get some enjoyment out of it."

We have a few up-to-date addresses: James B. Reber, 8 Briar Hollow, Houston, Texas 77027 and Edwin D. Hayward 2174 A, Via Mariposa East, Laguna Hills, Calif. 92653. Also Arthur W. Johnson, Apt. 105C, 400 N.E. 20th St., Boca Raton, Fla. 33432 and Thorn Dickinson, Bradley's, St. Huberts, New York 12943.

Frederick F. Mackentepe died on August 3, 1969 at his home, 850 Lake Shore Drive, Chicago, Ill. He spent most of his time in the Chicago area since leaving the Institute. Our records indicate an early association with the Whiting Corporation of Harvey, Ill. More recently he was connected with the Zarembo Co. of Chicago. Our sympathy is extended to Mrs. Mackentepe.—**Herman A. Affel**, Secretary, Rome, Maine, RFD 2, Oakland, Maine 04963

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A shining example of what makes ours the Class Supreme is the successful Class Dinner on October 24 at the M.I.T. Faculty Club in Cambridge, attended by 23 classmates and their guests: Larry Bailey, South Duxbury; Wayne Bradley, Moosup, Conn.; Jack Dalton, Sharon, N.H.; Ray Delano, Duxbury; Horatio Lamson; Clive Lacy; Larry Landers; Azel Mack; Archie Morrison; Frank Murphy; Harry Murphy; Ben Neal, Lock-

port, N.Y.; Stan Osborn, West Hartford, Conn.; Frank Parsons, South Yarmouth, Mass.; Wally Pike; The Pirate; Bill Smith; and Pop Wood; Peterboro, N.H.; and the younger members: Gene and Herbie Eisenberg, David Hamburg, Young Pirate Rooney and Bill Sheils. A fine crowd—no other class has a dinner or meeting like ours. When you see where they came from, the long distance men gave us locals a tight race. Frank Parsons cancelled his son's fifteenth wedding celebration to be with us. Now, there's class loyalty and interest. The regular attendees who could not make it sent their regards to the crowd: Sam Berke, Whit Brown, John Dalton, Jim Hoey, Fred Waters, Louie Young, and Max Woythaler, who was attending a local M.I.T. dinner in Framingham.

Charlie Norton phoned from Martha's Vineyard the morning of our dinner to say that he had been taken suddenly sick. In view of that much publicized accident at Martha's Vineyard last July, Charlie had planned to *swim across* (instead of walking on the waters)!

Our New York dinner will be held late in April at the Chemists' Club. After a Florida winter of bridge, golf and planters punch, **Larry Landers** will set this up for us. . . . **Jack Dalton** exhibited the Bronze Beaver recently awarded me by the Alumni Association and read the citation that went with it. I was deeply touched by the standing applause my friendly classmates gave me. Many warm thanks to you all.

At this writing we have 45 men who plan to attend our 55th reunion June 12-15, 23 not sure but want to remain on the mailing list and 14 who will not be able to go. Eighty-two answers from our mailing list of 129 is an encouraging 63 per cent. . . . **Ellis Ellicott** continues to enjoy good health in Baltimore and get retirement exercise from golf and raking leaves.

Our sympathy goes to **Ben Hurvitz** whose wife died September 30, while he was in the hospital during a long illness.

With regret we report that **Vincent Sauchelli** died October 1, 1969 in Baltimore.

On his way home from Cushing's Island in Portland Harbor, **Ben Neal** stopped to see **Sam Berke** in Lakeville, Conn. Unfortunately, Sam was away but Ben was pleased to visit his 450-acre farm with its 140 Guernsey cattle. . . . From 2814 Virginia St., Houston 6, Texas, **John Staub** wrote: "Entering M.I.T. as a graduate student denied me association with my classmates during the early years. I have therefore felt that any news of me would be of interest to very few of our members. My life has been a greatly blessed one—fine family, wife, three children and eleven grandchildren all living in Houston. Because of my architectural designs I have been listed in *Who's Who in America* since 1942. This also records my service as a naval aviator in World War I and II and in the

American Institute of Architects at the national level." It's good to hear from him.

In October, Charlotte and **Pop Wood** were at the Fall Lawn Bowling Tournament at Whitefield Inn, Whitefield, N.H. The inn is owned and managed by Randall Spalding, '22. His summer and fall guests include a number of M.I.T. people. . . . Bronze Beaver or not, how can I keep this column going without news and notes about yourselves? So how about a letter to help Azel.—**Azel W. Mack**, Secretary, 100 Memorial Drive, Cambridge, Mass. 02142

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From our forward-looking president, **Ralph Fletcher**, we have our opening words: "The invitation to our 54th reunion will be mailed shortly. The dates are Friday, Saturday and Sunday, June 12, 13 and 14, 1970. We look forward to an excellent attendance. This June we will begin our planning for the 55th. Also as we did last June, we will concern ourselves again with an in-depth discussion of the Institute's administrative, educational and research policies and review the current attitudes of students and faculty. This should be another great weekend—make plans now to be with us."

From close at hand, right in Boston, we have word from **Bill Drummey** who murmurs: "Mostly same old hum-drum existence. Big mistake to let myself become retired. Bored cock-eyed! Second thoughts are seldom the best." Then: "For the last seven months I've been a volunteer at the Shriners' Bureau Children's Hospital, only a few hundred yards from where I live—Charles River Park. It requires a strong stomach. Some are horribly scarred and maimed—far worse, somehow, than men hurt in war." Bill finally admits he's in competition with "our ancestor Noah—he made over 900 years, I think! Another birthday soon—contemporaneous with Jack Benny, still 39! Every good wish!"

"Scorpions in a bottle"

Vannevar Bush—that's a name we see all over, and understandably. We have this recent one in a letter to the editor of the *New York Times* by McGeorge Bundy: "Your excellent editorial on the arms race (Sept. 24) wrongly gives me credit for the phrase 'scorpions in a bottle.' The fault for your inadvertent error is mine. I had assumed that the phrase was now so much a part of the language that quotation marks and attribution would be unnecessary. Let me now report that the inventor of the metaphor, to the best of my knowledge, was Vannevar Bush, talking to a small group in Princeton in 1952. The phrase and its surrounding argument were later given wide currency by Robert Oppenheimer in an important article in *Foreign Affairs* in 1953. . . . Neither Dr. Bush nor Dr. Oppenheimer ever sought credit for such phrase-making, being vastly more con-

cerned with the danger than with the choice of words to describe it."

In mid-October **Dave Patten** wrote that he had received a letter from Jess (Mrs. **Thomas D'Arcy Brophy**) in which "she thoughtfully enclosed letters exchanged over the years between Steve and me, in various parts of the world. What a lot of memories, going back to Fortress Monroe in World War I." Jess expected to take off for Europe, returning to "On the Rocks," Pawling, N.Y. late this month. Dave's address is still Standish House, So. Duxbury, where the Plimouth Plantation is his principal interest. Asked if he had joined the retiree-set yet, his reply went like this: "Am I retired? No! We have a 350th Anniversary year, 1970, coming, across the bay at Plymouth. Our anniversary committee has been hard at work planning events which will involve a similar Plymouth, England, group sponsored by H.R.H. Prince Philip. Consulting, appraising, etc., and the tax collector keep us all humping. And finally, Dorothy's son Colonel Peter Russell, Deputy Chief of Staff in Thailand has just arrived for meetings in Washington and was with us last weekend for his 50th birthday."

The Chances Are . . .

Going southward a bit, we come to West Hartford where our Treasurer **Francis Stern** and our "systems analysis" expert **George Petit** live. Here we have a newspaper clipping from the Hartford *Courant* on October 8, just before the exciting World Series events. In the sports column, "With Malice Toward None" we read something of '16 interest written by sports editor Bill Lee. It reads: "George Petit, retired analyst of the Travelers, studies baseball by means of a ratio component system, which is certainly more scientific than my approach, but we both came to the same conclusion that Baltimore would beat Minnesota in the championship series. Mr. Petit made a study in depth of ratios of runs against men on bases, men on base against times at bat, runs batted in against hits, runs against opponent's runs, runs and hits against times at bat, left on base against men on base, earned run average and errors. Low points won and Baltimore had an 11 to 17 margin over Minnesota. The analysis Mr. Petit made showed, he tells me, that both clubs were in a cyclical downtrend late in the season. I have not yet heard from Mr. Petit about the World Series, but Saturday I made a public pick of Baltimore to beat the Mets. I wouldn't mind being proven wrong."

Now let us note what George wrote at that time about the World Series—he won't mind and is the first to say so, "Baltimore's chances to take the World Series are superior to those of the New York Mets according to Systems Analysis." Now George knows, and George knows we know, and again George is the first to point out that when predictions have a 9 in 10 chance of being right, there is always a time when that 1 chance in 10 comes along—without it,

there wouldn't be any 9 chances in 10. So the Mets can be considered as one of those 1 in 10 (or something) things—hooray for the Mets! What a wonderful influence they have been in the New York and nearby areas!

Our Class Baby

Emory Kemp, writing from Sarasota, Fla. tells of a big change in the life of our "Class Baby," Malcolm D. Kemp who was born during our freshman year as we attended the Tech of Boylston Street, and sat through hours of lecture and lab in Rogers, Walker and Engineering A, B and C. Writes Emory, "He has just given up his job as manager and treasurer of a house construction company near Lowell and was offered and accepted a position of Comptroller for the religious organization (world wide) FGBMFI = Full Gospel Business Mens Fellowship International, with his office located at the international office at Los Angeles. He sold his house in Braintree, Mass. and has moved to Santa Monica, 824 17th St., Apt. No. 4, 90403. You probably knew that he was very religious—he has wanted to do something like this. We are all wishing him enjoyment and success as comptroller of this large organization—Ruth and I will miss having him and his family here in the east." Yes, indeed, Malcolm, the best wishes of the Class of 1916 to you in your new work!

Emory also tells of a visit that he and Ruth made to Bradenton to see Peggy and Bill Ball, '05, and notes that Bill is now acting assistant secretary of the class of 1905. A little earlier, Emory attended a meeting of the M.I.T. Alumni Club of S.W. Florida to help in the planning of their program for the coming year. He says he often runs into and has a nice chat with **Andrew Witherspoon** when he goes down to the Sarasota National Bank.

And from Islamorada, Fla. this message was received from **Ed Parsons** at the end of October: "Just back from a 12,000 mile auto trip. From Jamestown, R.I. to Islamorada via the Tetons, Yellowstone, Glacier National Park, Banff, Lake Louise, Jasper, Vancouver, B.C., Victoria, Seattle, Mt. Rainier, the Columbia River gorge, the Oregon Coast, the Redwoods, a month at the La Jolla Beach and Tennis Club. Several happy meetings with Ke and **Johnny Ingle**. Visited my son in Houston, my daughter in Memphis and now home in Florida!"

The World of Architecture

A year has passed since **Mark Lemmon** put away his triangles and T-squares, closed his office and retired after 50 years of architectural practice in Dallas, where his name has long been synonymous with "the finest in architecture." His clients included the University of Texas, Southern Methodist University and many religious organizations. He was the consulting architect of the Dallas School Board for 20 years and his firm could point with pride, architecturally, to two high-rise buildings in the City of Dallas, the Tower Petroleum Building (22 stories)

and the Southland Life Building (42 stories). Now, he has been enjoying his separation from the troubles of designing and constructing buildings, especially so as the construction industry is having a most difficult time these days, they say. He writes: "My wife and I have just returned from two months in Europe, which was altogether a pleasure trip. I mention this because heretofore we have been going over there and I made a point of studying what was being done in Europe in architecture and enjoying the beautiful old structures and gorgeous gardens. We visited London, Lucerne, Amsterdam and Paris and, of course, came back via New York and spent a few days there.

"On boarding the S.S. *United States* at Le Havre I read the passenger list and came across the name of **D. K. Este Fisher**, who was a classmate at M.I.T. We had not seen each other for 53 years and enjoyed so much being together on the 5-day trip across reminiscing and discussing our practice throughout all these years. Este looks fine and is taking the recent death of his wife very bravely.

"This winter we expect to go to Jamaica and Florida; as a matter of fact we spent a vacation in Florida last winter. We are going to Jamaica to see a house my son has built there. I did a little consulting work for him on the design of the place, but, of course, he had a local architect to attend to the actual drawing of the plans and look after the construction. My son, Mark L. Lemmon, is a plastic surgeon here in Dallas, and the house he has constructed with two other people is to be a business venture and a vacation spot for the three couples when it is not engaged. He and his wife and two children have been going to Jamaica for a number of years and seem to be in love with it. My wife and I have never been there and are looking forward to going. I do a little work these days but not much. However, I seem to keep occupied at something so that I won't get bored after a very active practice. We have a wonderful climate here for golf and I play several times a week. In spite of my venerable age I can still walk around and swing a golf club inaccurately but I have a lot of fun at it."

Speaking further of architecture, we also have word from **Charlie Cellarius** who too retired last year—he, from the firm of Cellarius and Hilmer, Architects of Cincinnati. Charlie spent his whole professional life as a practicing architect in Cincinnati. While he designed buildings of many types, his principal works have been in the field of university buildings and churches. As he indicated in his bit-of-history questionnaire at the 50th reunion, "Probably the most satisfying task I have had was the planning for buildings for Miami University, a State University at Oxford, Ohio. Here I made a Master Plan 30 years ago and have built more than 30 buildings at that University—they have all been the same style—generally colonial. The harmony and restful beauty that has resulted has been most satisfying." In early October

Charlie wrote: "Just got back from six weeks abroad—I went over on the Leonardo da Vinci, then had another week of cruising on the Stella Maris visiting the islands of the Aegean Sea. After a few days in Athens I spent ten days in Italy, mostly Venice and Florence, and then a week in Portugal which I had never visited before. Having retired from my architectural partnership last year, there isn't any more news!"

Also from Ohio, specifically from Wade Park Manor in Cleveland, we have a brief report from **Ralph Spengler**: "You ask what I have been doing or where I have been. Two trips to the hospital so as to keep the doctors entertained is about the only thing that I have been doing. As I tell the doctors, when you are old about all one can do is to read and smoke. That about tells you of my accomplishments."

"Anything"

Our readers may not know it but your secretaries receive a generous number of wonderful letters of appreciation and approbation that really constitute high pay for what we do—some of them with bits of helpful understanding in reference to the kinds of problems that we may have. One such letter came in October from **Allen Pettie** of Tryon, N.C., a good friend with whom we have had multiple contacts since graduation day in 1916. For example, he writes: "My Yale class secretary asks for 'interesting' news which is somewhat terrifying, while you claim to be grateful for ANYTHING. In making a quick comparison, I would say that your approach is far more successful than the other." Then Allen proceeds to illustrate blithely: "While I haven't yet gotten at my hoped-for avocation of book binding, I am still having fun in various fields: plumbing, for example. When the local plumber works a couple of hours at a refractory combination sink faucet, finally throwing up his hands and recommending a new assembly at an inflated cost, I get a bit of satisfaction in fixing the old one, even to my wife's satisfaction, by a judicious application of patience, blood, sweat and a bit of graphited, greased, asbestos string. I may have missed my calling.

"Or, take the case of the new carport foundation, built of concrete blocks on a steep slope, supposed to be 13 feet by 20 feet. When the experts are done with it, the corners are almost square and the errors in length and width run only up to three inches. The fun now is to conceal all errors with a reinforced concrete slab of substantially the right shape and dimensions so that the superstructure can be built 'square.' And it's fun to dabble in oils to achieve pictures (from my slides) which add color (at least) to our living room walls and continually remind us of when we were at Hadrian's Villa outside of Rome, the ancient sanctuary at Atotonilco, Mexico, and the fishing boat wharf at Provincetown, Mass. with the slim Italian tower (a la Giotto) in the background. There, I think the above falls under the head of 'anything.'" No question about it, Allen!

Last month we mentioned that **Willard Brown** was going to an M.I.T. Club of Southern California dinner in Los Angeles to hear Bill Bergen, '37, who is president of the Space Division of North American Rockwell, talk about the Columbia moon capsule. Willard has since reported that Bill's composite set of movies and stills was far and away the best thing of the kind he had seen. Then he told of a story that Bill had given at the dinner—a story that “clings,” says Willard. Trusting that this will not be a replication of the same thing reported elsewhere in this issue, here is the way Willard retold it to us:

“This chap had graduated at the foot of his class in college, although he had majored in math, and in the yearbook was voted the man most unlikely to succeed. Well, along came a reunion—he flies in his private plane with two pilots and sends his limousine and chauffeur ahead to meet him at the airport. At the banquet, the boys got him up on his feet and asked how in the world he ever amassed such a fortune. ‘Well,’ he said, ‘it was simple. I found out how to make this gismo at a cost of one dollar each, that I could sell for five dollars each, and boys, you simply have no idea how fast that four per cent adds up!’”

Now, coming back east, we have word from **Val Ellicott** in Baltimore and his answer to a question whether he was still active with nursing homes. His reply: “I will always be interested in nursing homes though more and more on the side lines as I get older. The new requirements under Medicaide should result in better patient care especially those requiring a medical evaluation at the time of admission and periodically afterwards.”

Brad Curtis in Interlaken, N.J. gives us a good report: “Health is good, both for myself and for my wife. We spend most of the time here at home but some time at ‘Point o’ Woods’ in South Lyme, Conn. on Long Island Sound; I like to be on the water some of the time. Used to sail the waters of Long Island Sound in my younger days. I keep active at my wood working hobby. Recently I found some friends (mostly retired) who wanted some chairs reglued and repaired, also some caning. I do

not charge for the work so I am not getting rich. We enjoy the months of October, November and December at the shore. We have a number of trees—oaks, gumwoods, maples, hollies, beeches—on the property and the leaves are beginning to turn into reds, yellows and browns.”

As you drive north on the northerly end of the Garden State Parkway in New Jersey, as we often do, you will see a sign that says “Wearimus Road” in Ho-ho-kus. That is **Jack Stafford**'s address. He writes that the record of his activities in the 50th reunion “class histories” still holds—fishing, hunting and bowling—“and no doubt will as long as I can negotiate the fields, streams and bowling alleys. This doesn't take me more than 100 miles from home except for short trips to the Bahamas once in a while bonefishing. I traveled so much in the sugar business to the Philippines, Central and South America, West Indies, Mexico, etc., that I am glad to stay at home now.”

We continue to have the joint 1916-1917 monthly luncheons in New York, at the Chemists' Club, 52 East 41 St., a block from the Grand Central station, at noon on the Thursday following the first Monday of each month except in summer. Your assistant secretary sends out the notices. In October those present included Walt Binger, Mac McCarthy, Herb Mendelson, Francis Stern, Peb Stone and Harold Dodge. The November luncheon was larger with Walt Binger, Joe Barker, Jim Evans, Rudi Gruber, Mac McCarthy, Herb Mendelson, Francis Stern and Peb Stone; plus three '17ers: William Neuberg, Dix Proctor and Clarence Sealy. We suggest you plan your next trip to New York on one of these luncheon dates.

Again we come to the end of the column, urge that you start planning now to come to the 54th reunion in Chatham next June 12-14, and are pleased to express our advance appreciation as you keep on writing a little but writing often to your ever-grateful secretaries.—**Harold F. Dodge**, Secretary, 96 Briarcliff Rd., Mountain Lakes, N.J. 07046; **Leonard Stone**, Assistant Secretary, 34-16 85th St., Jackson Heights, New York 11372

17

Quoting from **Ai Lunn** in regard to our 52nd reunion at Northfield: “I am already getting some fan mail regarding the reunion; Dud did well. There seems to be general agreement that we had a fine reunion and that Northfield Inn was a wise selection.” The *Greenfield Recorder* of October 9 states that '17 was represented by 67 members and wives. Incidentally our honorary member, President Howard Johnson, advised at the time, “We wish we could join you and hope you all have a wonderful time.”

At the 52nd reunion, among other things of import, it was voted to extend to Dr. Julius A. Stratton honorary membership in the Class of '17. Quoting from his letter of October 29, 1969, “I have just returned from a twenty-day journey that took me first to the Middle East and then on to Pakistan and Japan, and I can't tell you with what surprise and genuine pleasure I read your letter that was awaiting me on my desk. Nineteen seventeen is one of the great M.I.T. classes, and I should consider it a very special privilege to become an honorary member.”

Bob Erb's postal to **Dud Bell** dated September 17 states that an important directors' meeting prevents him from attending the 52nd, also that Pat and he are leaving on the 13th for a month in the Orient. They must have made it as we have received a postal showing the Super Express of the New Tokaido Line, (speed 200 KM/h) passing Mt. Fuji and they comment, “... the Loengards and the Erbs are on tour—wish you were here. These railroads are quite different from the ole New Haven.” I also received the Erb itinerary with comment, “we will meet the Loengards in Tokyo October 15th.” All of which behooves a review of their African trip last year—“It was great!—so great that we plan to go back in January '71. We arrived in Nairobi, Kenya on January 14.

“On January 16 Pat and I joined by another couple from New Canaan, Conn., who had been in South Africa, started out in a Toyota Land Cruiser with a delightful girl courier and a driver. We



Al Lunn, '17, (left) and Ruth and Bill Dennen, '17, at the Twenty-First Annual Fiesta of the M.I.T. Club of Mexico City, 1969.

got back to Nairobi on February 17. Having been through Kenya, Tanzania and Uganda, we visited many National Parks, (Tasvo East, Tasvo West, Lake Nauiyara, Ngorongora Crater, Serengenti, Mava Mava, Queen Elizabeth, Murchinson Falls, and others). These parks abound with animals—buffalo, elephant, leopard, rhinoceros, zebra, hippopotamus, baboon, monkey, shrew, cheetah, lion, hyena, jackal, fox, mongoose, giraffe, warthog, bush pig, antelope of many varieties, hartebeest, wildebeest, topi, impala, waterbuck, eland, etc., etc.—as well as thousands of beautiful birds. The scenery is unbelievable. The natives are friendly and the accommodations are very good. Most places we slept in were comfortable lodges—a few nights in tented camps.

"Although Pat and I have never been serious photographers, we bought new equipment and came home with 900 colored slides. You just can't stop taking pictures of these animals and birds. The days were very comfortable—nights cool when we were at 7000 to 8000 feet. Real hot at the river Nile and stifling at Mombasa on the Indian Ocean. Cities such as Nairobi, Arusha, and Kampala are beautiful, having ultra-modern hotels. The Apolo Hotel in Kampala, Uganda is the equal of the most modern resort hotel in the States. Since independence there is a great rivalry in the three East African states of Kenya, Tanzania, and Uganda—too bad they could not federate. There is a tremendous effort on the part of the governments to force the replacement of the English and Indian personnel in business with natives, but the natives in general do not have the education or training as yet. Tourism thrives and within a few years these beautiful countries might be spoiled. The popular Mount Kenya Safari Club and Treetops are well worth seeing. I could go on and on, but this is enough—we recommend East Africa. We spent a few days in Athens on our way home, and New Canaan looked awfully good even with the heavy snow when we arrived at the end of February. It is later than you think. I want to go places we have never been while I am mobile."

From the Office of Public Relations of the Institute—Buzz Aldrin, who with astron-

naut Neil Armstrong landed on the moon last July was appointed to the Corporation Visiting Committee for Earth and Planetary Sciences. The Committee is concerned with teaching and research programs in both the Departments of Earth and Planetary Sciences and the Department of Meteorology. M.I.T. has 26 visiting committees for its various academic departments as well as for other Institute activities. As of November 2, **Ed Aldrin, Sr.**, a 32nd degree Mason, advised that Buzz had been honored in Washington, D.C. by being raised to the Thirty-third Degree, also the Knights Templar have given Buzz the Cross of Honor. **Stan Dunning** received the following letter from the M.I.T. Alumni Fund's Kenneth Brock: "It is my pleasure to tell you that the Alumni Fund Board has awarded you a Certificate of Appreciation of recognition of your efforts in leading 1969 Alumni Fund to record-breaking totals." **A. Raymond Brooks** also received this same award, which was to have been presented to him at the meeting of the Northern New Jersey M.I.T. Club on November 6. Stan's comment: "Of course it is good to have, but the credit for our 1917 showing goes to our loyal contributors."

The Twenty-second Annual M.I.T. Fiesta in Mexico City will be held March 12 through 14. Dr. and Mrs. **James R. Killian, Jr.**, are the guests of honor. Ruth and **Bill Dennen** on their annual pilgrimage to the Fiesta will deliver the coveted Bronze Beaver Award, which was given to Bill to present to the M.I.T. Club of Mexico City.

Al Lunn reports on his attendance at the Twenty-First Annual Fiesta of the M.I.T. Club of Mexico City: "It was an outstanding affair as always. About 115 alumni from north of the border participated. The Class of 1917 was well represented by its honorary members, the Howard Johnsons and the Don Severances. The Bill Dennens were there for the 14th time, and Al for his 7th. The Dusty Wilsons were in Mexico City, but did not show. We tried several times to reach them by telephone, but without success. Conchita did not attend the festivities, but took the Howard Johnsons through the Archeological Museum and entertained us twice at home. She is well

and facing the future with great courage."

Thomas Meloy advises through an unknown source: "I do not think there are many of my classmates who will be interested in what I am doing from the celestial viewpoint. Suffice this, I am chairman of Codex Corp., Chairman of Isomet Corp., a trustee of the National Security Industrial Organization, and a member of the Virginia Board of Vocational Rehabilitation, etc., etc. Am playing very poor golf and trying very unsuccessfully to retire."

Dud Bell received a postal from Mrs. **Charles M. Ewan**, 2924 North Atlantic Blvd., Fort Lauderdale, Fla., advising that Captain Ewan died April 20, 1969 at Miami, Fla.

Address changes: William W. Eaton, 2619 Wilshire Blvd., Los Angeles, Calif. 90057; F. John Kruse, 629 Southeast 19th Ave., Deerfield Beach, Fla. 33441; Frank E. Peacock, 2425 Oxford St., Rockford, Ill. 61103.

The November '16-'17 Luncheon was held at the Chemists' Club in New York on the 6th. There were 11 in attendance and again the Seventeeners listened respectfully to the eight Sixteeners.

By special endeavor the Review was able to include in our January notes a brief notice of the death of our **Dix Proctor** on December 13. We all know how devotedly Dix gathered and produced our class notes. They were uppermost in his mind.

Dix had varied activities in World War I and in the immediately following years as an army officer. In 1925 he formed his C. D. Proctor Co. to specialize in selling machine tools, machinery, and bearing bronzes. He retired in 1955 but not to a life of ease. He and his wife Vi kept very busy in caring for and extending the "Proctor Compound" in Lincoln Park, N.J. He was a conservationist in outlook and action. A particular interest shared with equal enthusiasm by Vi was their extensive and frequent cargo vessel cruises. He was an active churchman and kept up his interest in his Phi Sigma Kappa chapter at M.I.T. He was active

in the M.I.T. Club of Northern New Jersey as well as the M.I.T. Alumni Center of New York. He served as assistant secretary under Win McNeill and succeeded him as secretary in 1966 immediately maintaining the high McNeill standards.

Services were held for Dix in his Dutch Reformed Church and were attended by '17ers Ed Aldrin, Ray Brooks, Dud and Helen Bell and Bill Hunter. He is survived by his wife Vi who is affectionately known by all of us, and to her our heartfelt sympathy is extended. Dix will continue to mean much to the Class of 1917.—**Stanley C. Dunning**, Secretary, 6 Jason St., Arlington, Mass. 02174

18

Everyone remembers *The Tech* which has been published continuously since 1881. It has grown in size, of course, and in its text. Our version largely recorded such events as the results of the gym team meet, the next meeting of the Chemical Society, the tryouts for "Tech Show" and so on. The editorial content was brief and was concerned with you and me—the student at M.I.T. Now the news is largely devoted to the activities of S.D.S. or S.A.C.C.—often to what they may be doing at Harvard or Berkeley as well as on campus. It overshadows items such as the doings of the Mandolin Club, the sailing group, the track team and so on. In addition, the confrontations are responsible for many letters to the editor from writers of all convictions.

A new dimension in reporting campus activities has been the appearance of several newspapers in the last year or so. *Thursday*—published weekly—claims a circulation of 5,000 at ten cents a copy. It is quite "liberal" (condones violence) but is sympathetic to the objectives of the activist groups. It is having a struggle to survive; lack of income threatens its continued existence.

Ergo, also published weekly with a circulation of 5,000, is distributed free. It is conservative—quite critical of the M.I.T. administration and faculty.

The Tech is "liberal" but not so far left as *Thursday*. It separates its news from the editorial comment better than the other campus papers.

Another publication is the *Catalyst* printed and edited by the graduate students—middle of the road; and S.A.C.C. is devoted solely to stopping war research of any kind at M.I.T. All this adds up to the fact that there is plenty of ferment and activity from every point of view on the M.I.T. campus. More than that, the impression generated by most of news media—the daily papers and television—that S.D.S. groups are the only ones who speak their minds is not true at M.I.T.

And now to the good old days and personal news since the previous edition.

From the *California Oil World*, this interesting item about **John Abrams**. The article, titled "Water, Water Everywhere" reads as follows: "I have just finished perusing a copy of the Inyo Register and was interested to note that my Bishop operative, John McClelland Abrams, in whose scintillating career Massachusetts Institute of Technology takes no little pride, has preempted about two-thirds of the back page to delineate the fluid flow of the many ditches that come under the jurisdiction of the Bishop Creek Water Association. The inhabitants of the involved area were expecting a record flooding season because of the heavy winter snows, and I presume John Abrams, who is the secretary of the water association, plotted this complex system of runways to show where due precaution must be exercised to keep the path of the flood waters clear. It all takes me back to Jane Taylor's famous poem which can be adapted to many situations, this time, for instance, as follows: One honest John Abrams, a mapper of ditches, Had no inclination to pile up more riches, For all such ambitions in him were prevented By a fortunate habit of being contented." Another item from California arrived from **Rolfe Folsom**. He writes: "This letter is in the way of an apology for not writing you long, long ago. First, thanks so much for the delivery of the group photo, which came to me in Melrose, in perfect condition. It serves to remind us of a thoroughly enjoyable and worthwhile occasion. We are very glad we went—as a matter of fact, we'd like to turn back the clock and have another 50th!

"Incidentally, at that reunion we met again, after 50 years, **Harold Atwell**, and for the first time, his wife Emma. But the point in mentioning this, for we also met many other friends for the first time in 50 years, was, that when we were in Mexico City last April, who should we meet at the Folklore Ballet but Harold and Emma! Strange how these things happen.

"We like to travel by car with trailer, which was the way we came back there a year and a half ago. Our trip to Mexico last spring was also by trailer, and we went the whole way to Yucatan, where we explored so many ruins that until we sorted out our pictures they were rather mixed up in our minds. Now I have edited and arranged some of them into a slide presentation complete with narration and automatic changing, and if you ever get out this way, we'll inflict it on you, regardless of your wishes. Frankly, I get more kick out of the automatic changing than the pictures! It tickles me that I was able to make it work!

"On the subject of 50th anniversaries, we celebrated our golden wedding anniversary on October 30th last, another happy milestone—and don't they come fast! And we'd like to come back there again—say for the 55th? Also, though I don't help out much, I really appreciate your class notes. Thanks very much for

your dedication." Congratulations at this late date on your Golden Anniversary, Rolfe. On our 55th, bring those pictures of Yucatan—we want to see them.

Another item concerns our own **Sam Chamberlain** and is reprinted here from the *Lithopinion*: "Samuel Chamberlain has provided the photographs for *ITALY 3: Speaking of the South*. In his long career as an artist and photographer innumerable prints, photographs and books have flowed from his compassionate eye and hand. He lives in a seventeenth century house in Marblehead, Massachusetts. His wife, Narcissa, and daughter Narcisse have collaborated with him on the outstanding Gourmet books *Bouquet de France*, *Italian Bouquet* and *British Bouquet*, full of great pictures and fabulous food. His first successful cookery book, *Clementine in the Kitchen*, published in 1938, under the pseudonym of Phineas Beck, has been through a large number of printings. In addition he has published through Hastings House a number of photographic volumes of American and European architecture. The Boston Public Library published his *Etched in Sunlight—Fifty Years in the Graphic Arts* last year."

A little over 50 years ago, on May 27, 1919, a U.S. Navy flying boat, NC4, landed in Lisbon, Portugal to complete the first transatlantic flight in history. **Ted Wright** was one of the early aviation pioneers responsible for this success. The flight was originally planned as a wartime operation when Glenn Curtiss was commissioned to construct four flying boats. Ted was Navy Chief Inspector at the Curtiss plant. The Nancies, as they were called, were huge by 1918 standards—70 feet long with a wing span of 126 feet—and carried 51 passengers at a top speed of 95 miles per hour. On May 8, 1919, the NC4 with Ted aboard took off from Long Island Sound. Four hours later it was forced down at sea and finally reached the Chatham, Mass. Naval Station the next morning. After repairs it took off from Newfoundland, May 16 for the 1,280 mile hop to the Azores arriving there 15 hours and 18 minutes later. On May 27 it flew to Lisbon to become the first plane to cross the Atlantic. Her flying time was 25 hours and 1 minute with an elapsed time of 11 days. She later continued to Plymouth, England to receive further world honors.

From his first Naval assignment with the Nancies in 1918, Ted embarked on a career in aviation spanning over half a century, during which time the air age progressed into the space age. Upon completing naval service in 1921, he joined Curtiss Airplane and Motor Co., Garden City, as assistant chief engineer. He later served as vice president of engineering, then general manager of the airplane division of Curtiss Wright Corp., and vice president and chairman of the Engineering and Policy Committee until 1940.

In 1940 Ted went to Washington as director of the Aircraft Resources Control

Office of the War Production Board, where he served for four years. He was administrator of Civil Aeronautics from 1944 to 1950. He was vice president for research at Cornell University from 1948 to 1960 and in 1952 he served as acting president of the university. In 1948 Ted became president and chairman of the board of directors of Cornell Aeronautical Laboratory at Buffalo, retiring at the beginning of this year.

Among the numerous awards received by our classmate for his work in aeronautics are the Wright Brothers Medal of 1930, the War Department Medal of Commendation for exceptional civilian service in 1944, the Daniel Guggenheim Medal of 1945 for "outstanding contributions to the development of civil and military aircraft and for notable achievement in assuring the success of our wartime aircraft production program," and the Presidential Medal for Merit presented by President Truman in 1945.

Though in retirement, Ted still maintains active participation in the aviation world as a member of the Institute of Aerospace Sciences, the Hill Space Transportation Awards Committee, the Elmer A. Sperry Board of Award, and the Fund for Peaceful Atomic Development.

Here is the interesting story of some of **Henry Berliner's** experiences to date. He inherited much of his talent from his father, Emile Berliner, the inventor of the Victor Phonograph, a telephone transmitter, and numerous devices in aviation. Henry recalls their experiments (in 1903) with rocket propulsion applied to an unmanned airplane about 8 feet long. It flew 40 feet. At that time interest concentrated on vertical flight. After graduation from M.I.T. and service in World War I came the Berlin Helicopter. In 1919, with Henry at the controls it rose 5 feet. The 1924 version reached an altitude of 15 feet for a duration of 1½ minutes. This helicopter is now in the National Art Museum collection.

Henry, together with the late Professor Edward P. Warner, '17, developed an advanced type cabin airplane. Then, in 1929, he joined with Temple-Joyce to form the Berliner-Joyce Company of Baltimore, producers of a number of successful fighter airplanes for the army and navy. In 1938 he founded the Engineering Research Corp., of Riverdale, Md., makers of aircraft manufacturing machinery, instruments, compressed wooden and plastic propellers, and other devices associated with the development of aircraft. The Ercoupe airplane was one of the better-known products of this corporation.

Henry entered the Eighth Air Force in June, 1942, on Major General Carl A. Spaatz's staff as A-5, chief of war plans, with the rank of major. While in the Eighth Army in England, he analyzed Royal Air Force reports on air raids over occupied Europe and advised on engineering and other matters, including increasing bombing effectiveness. In

February, 1943, he was removed from active duty because of illness and resigned from the service in February, 1945, with the rank of colonel.

In March, 1945, he traveled to Europe as a civilian adviser to Lieutenant General Spaatz for the purpose of investigating German technical accomplishments which might be applicable to the war against the Japanese; this took several months.

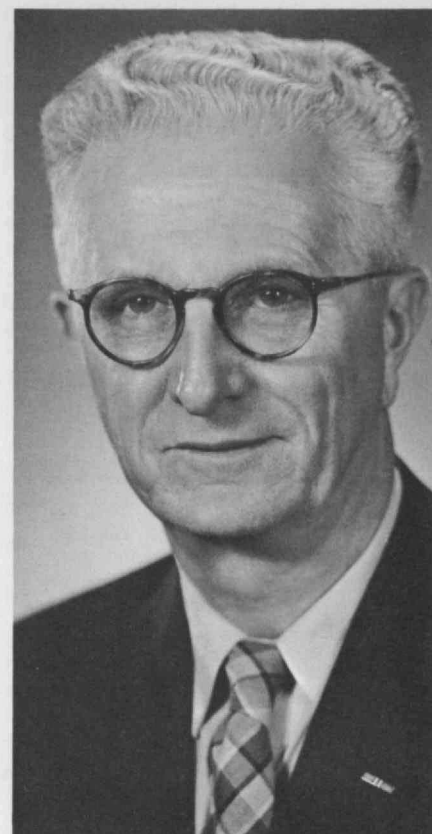
Henry has retired from the active design and production of aircraft and components, but he continues to exert a progressive influence in aerospace and other fields of science. Henry received two military honors: the Distinguished Service Medal from the United States and Commander of the British Empire from Great Britain. He lives at 2841 Tilden Street, Washington, D.C.

All you loyal sons of 1918, send me news of you.—**Max Seltzer**, Secretary, 60 Longwood Ave., Brookline, Mass. 02146

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We have further and welcome news of what must be a fifty-year class whose zeal for travel and zest for living remains unparalleled. **Stan Reynolds** writes of extensive and intensive travels starting with a motor trip from New York City through the Pennsylvania Dutch country down the Blue Ridge mountains and along the Great Smokies to Williamsburg; another north and east to Maine, New Brunswick, Nova Scotia and Prince Edward Island; a third motor trip across the U.S. to the west coast that included almost every national park and some in the Canadian Rockies; then across the water to the British Isles; a side trip to Guatemala and Mexico City; and finally a trek to the Yukon and Alaska to round out thirteen thousand miles of driving—all accompanied by his beloved and redoubtable Dottie as traveling companion, whose death last spring halted this remarkable saga of world travel. I am sure I speak for the class in extending heartfelt sympathy to Stan at this great loss.

Last month I mentioned that **Foster Doane** had been briefly glimpsed in Athens during one of his many world tours. Now a letter from Foster details this with word that he and Gladys were on a sightseeing trip in the course of imparting some of his renowned expertise on pulp and papermaking to European mills. They embarked from Montreal to Liverpool where they inspected the famous bronze birds reputed to flap their wings whenever a virgin passes by. From London they journeyed to Rotterdam taking a boat down river to Basle, thence to Zurich, to Innsbruck, via bus to Oberammergau, then to Vienna, and a tour through Yugoslavia, Greece and Italy where they explored Rome, Siena, Florence, Ravenna, Padua and Venice. They then returned to London only to proceed to France for a few weeks. From France it was only a short day's trip home to



Theodore Wright, '18

Neevah, Wisc. Foster and Gladys are planning to spend Christmas at Frank Badger's motel in Hollywood Beach, Fla. "Then," says Foster, "we are looking forward to our 50th!"

Harry Kahn, whose world safaris in the interest of tile and ceramic manufacture have also been mentioned briefly, confirms an account of his travels for the past year. After returning from the Philippines where he served as a member of the International Executive Service Corps with the Fil-Hispano Ceramics Division, he went to Germany, Holland, Switzerland and Italy to purchase tile-making equipment taking time off to visit the cathedrals in Sachen, Cologne and Milan. From Europe Harry and Hannah toured India and Bangkok before returning to Manila. Leaving there six months later via Bali, Singapore, Tokyo and Honolulu, they returned to home base in Uxbridge, Mass.

Another classmate who happily combines duty with pleasure is **Alden (Dusty) Miller** of Phoenix, Ariz. Not content to settle down, Dusty aligned himself with the American Automobile Association and this involves considerable travel including Alaska, Hawaii, South America, Mexico and Europe, *all in one year*. Dusty reports a visit with **K. B. White** at his chateau in Arthies on the Oise River, an event pleasantly confirmed by letter from K. B. who says that Dusty and Clothilde have a wonderful set-up in the travel business checking on the A.A.A. hotels to see whether they are worthy of recommendation. (Dusty says they are all super). K. B. also men-

tions a visit from "Count" Dumas of Quebec who was visiting his son's family living in Paris. "Between Quebec, Mexico and Paris," says K. B., "the Dumases seem to lead an exceptionally enjoyable existence." K. B. says he is semi-retired and spends most of his time at the chateau which "never leaves a dull moment. It would be pleasant to receive other distinguished visitors such as those noted," says K. B. Dusty told K. B. to be sure to join us for the 50th. We certainly hope he takes this advice to heart!

After noting these far-flung and exotic doings it seems a bit of an anticlimax to report that your reunion committee and wives ventured forth as far as Narragansett Bay in order to verify at first hand the accommodations for our gala reunion clambake at Squantum Club. We are happy to report unanimous and enthusiastic endorsement of the site, the facilities and the seafood at this famous old club. Everyone who attends this reunion is in for a glorious outing. We guarantee it! **Norrie Abbott**, who is a lifetime member of the club, pointed out the location of a brand new apartment directly across the Bay, where he and Betty will be taking up residence as soon as completed. It looks like an ideal spot.

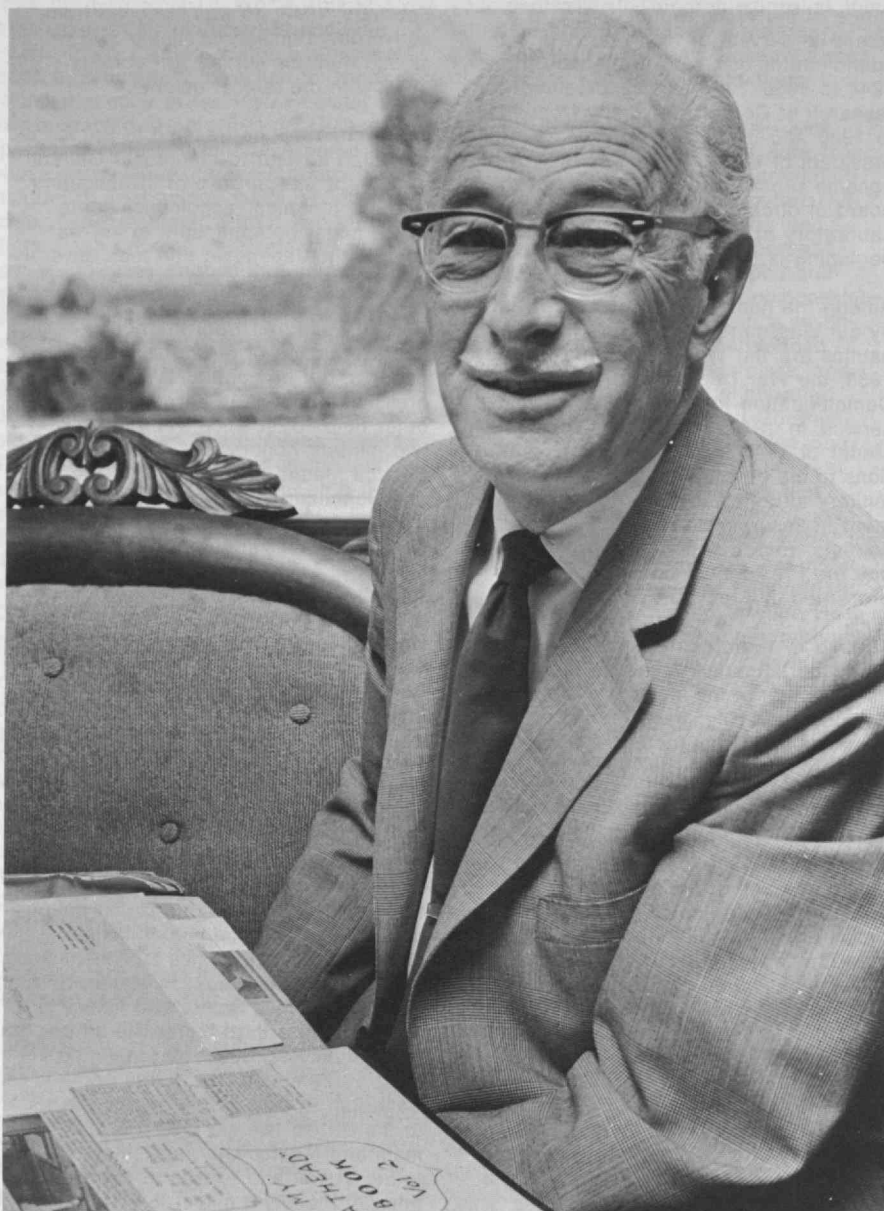
Will Boyer, Box 1884, Santa Fe, N.M., writes that he and Elma celebrated their 50th wedding anniversary last spring. The Class extends hearty congratulations, Will. We wonder whether other classmates have achieved this distinction and would like to hear; or could this be the first one? The Boyers have two granddaughters. Will says that even as early as October 11 they had snow in Santa Fe so decided to move south to their other home in San Antonio, Texas.

Jack Logan sends welcome word that he and his wife are enjoying life in their small rural village 12 miles from Bedford, Pa. Jack mentions that they may be found in the Bedford phone book. Knowing Jack we can believe him when he says "we have made many friends both native and 'city-folk' retirees."

I am unhappy to report the death of **Arthur Grosscup** of Wayne Dr., King of Prussia, Pa. Arthur died in early September last year. No details yet.

Through the cooperation of Henrietta Pope, widow of Dr. **Alton S. Pope** of St. Petersburg, Fla., who died last summer, I am able to give you further word about Alton. He was born in Manchester, Maine, settled in Newtonville, Mass. where he was to become commissioner of health for the commonwealth, then moved to Florida in 1959 and was associated with the Pinellas County Health Department. His daughter, Mrs. Margaret Sullivan, lives in Watertown, Mass. Mrs. Pope lives at 105 20th Ave. SE, St. Petersburg.

I am also able to give you further word about **Edmund Bigelow** of Silver Spring, Md., who died last September. His



Albert E. Fowler, '21, former actor, producer, director and broadcaster, now semi-retired but continuing as a free lance writer, looks over a treasured volume, My "Fat-head" Book, Vol. 2. Photo from the Courier News.

widow, Dorothy, 9704 Mount Pisgah Rd., writes that Ed, who was a native of Boston, was associated with a furniture company in Portland, Maine, before joining the Mazor Company in Washington, D.C. During World War I he joined the French Red Cross Ambulance Corps and was awarded the croix de guerre. He leaves two grandchildren.—**Harold Bugbee**, Secretary, 21 Everell Rd., Winchester, Mass. 01890

21

In these days of dramatic events on American campuses, it seems to us, and we feel sure it is the consensus at M.I.T., that alumni should be well informed and continuously updated on the basic objectives of our Institute and the day-to-day developments. We sincerely hope that you are making every effort, as we

are, to keep abreast of attitudes and happenings on campus in Cambridge directly from their source and uncolored by news media or word of mouth transmittal which we already have found to result in grossly distorted pictures. To aid you in this effort we encourage you to address your queries and comments to your secretaries or to any of the officers of the Class of '21. We'll do our best to furnish prompt and candid replies. We do ask that you include news of yourself, your family, travels and other items which are of interest to your secretaries and to the Class.

Show biz

Albert E. Fowler, 432 Van Holten Rd., Somerville, N.J. 08876, a native of Newburyport, Mass., where his family was among the first settlers in 1635, has written to Sumner Hayward that he is partly retired but carries on as a free

lance writer. He and his wife, the former Helen F. Ballou of Newburyport, have a cottage there at Plum Island, where they spend each summer. Their son, Richard, M.I.T., '49, is a senior research engineer in the Johns-Manville Research Center, Manville, N.J. Al, a friend of actor Roddy McDowell who nicknamed him "Alfalfa," was fascinated by the fledgling movie industry as a boy and subsequently appeared in every possible amateur theatrical until his family dictated attendance at Huntington Prep. and a college education. He was associated with us in Course V and went on to earn a Ph.B. with the Brown class of '22. His subsequent partnership in the Century Players, Lynn, Mass., led to the management side of show business although he actually wanted to be on stage. Thereafter he managed many theaters, among them those in Bangor, Me., Pittsfield, Mass., and, in Boston, the Capitol, Fenway and Uptown, the last famed for his fanfare over the opening of "The Vagabond King." He says he directed and produced old-timers such as "East Lynne" on early radio programs to the accompaniment of a "three-piece symphony orchestra," and did some broadcasting of his own as "The Yankee Philosopher." These activities projected him into the public relations field, where he publicized Walt Disney's "Fantasia" and then joined the 20th Century-Fox organization in Boston to handle their publicity for the northeast. He later accompanied Jose Ferrer on a long lecture tour to herald the coming "Cyrano de Bergerac" and then beat the drums for many famous extravaganzas including "The Red Shoes," "Tales of Hoffman" and "Down to the Sea in Ships," for which his center of operations was the whaling museum in New Bedford, Mass. With the end of the period of big pictures, the Fowlers bought an apparel shop in their beloved Newburyport and expanded it into a department store, until a heart condition forced his retirement. Al says any mention of his former association with show business invariably causes listeners to query, "Oh, Are You An Actor?" which he adopted as the title for a book on which he has been working. This is not his first attempt at describing the action behind the scenes. Years ago, he wrote for the Newburyport Historical Association a history of the "Theater Premier," the converted Newburyport store with a sheet for a screen and folding chairs from the local undertaking establishment for the audience. This had been the silent movie house that influenced the course of his life way back in 1907.

New Jersey clan '21

Assistant Secretary **Sumner Hayward** undertook a chore of considerable magnitude in writing to all of the more than two dozen members of the Class of '21 known to have addresses in New Jersey, inviting them to an October Dutch treat luncheon in the centrally located American Hotel, Freehold. Sumner drove down from his northernmost town of Ridgewood, **Ralph M. Shaw, Jr.**, came up from Beverly in the south and **Munroe C. Hawes** and Maxine

and **Carole A. Clarke** arrived from centrally-located Sea Girt and Brielle, respectively. Food in the famous old tavern was at its usual peak and the small group enjoyed a series of discussions ranging from Rufe's experiences with surprising heritages of his hundred-year-old company to Munnies's golf and duck shooting, and Sumner's and Cac's recent experiences on the M.I.T. campus. It is hoped that similar luncheons be scheduled once or twice a year either in Freehold or some other central location. If you live in or near the New Jersey area, your comments and suggestions will be welcomed by Sumner.

Besides the grand letter which Sumner received from Al Fowler, a few of the others to whom Sumner had written also took the opportunity to write him and express thanks for his courtesy. **Alfred H. Fletcher** says: "A luncheon in New Jersey sounds fine to me and perhaps I can make it to the next one. Received your letter too late to attend since I retired last August and have moved to 12-B Village Mall, Rossmoor, Jamesburg, N.J. 08831." As noted in the *Review* for October/November 1969, Al had been director of the Division of Environmental Health, New Jersey State Department of Health. . . . **Merritt F. Farren**, 403 N. Fullerton Ave., Upper Montclair, N.J. 07043, wrote: "Your letter came while I was in Portugal. I would not be able to attend lunches in Freehold."

Wolfe W. Brown, 114 Wellington Ave., Short Hills, N.J. 07078, retired Bell Laboratories engineer, penned: "Unfortunately, Tuesday is one of my full days but if you schedule any more such luncheons please drop me a line. As you know, I have not kept in touch with classmates over the years but I am sure I would enjoy meeting them again. I have just returned from a trip to Hawaii, which I enjoyed very much. Since retirement, I have done a bit of traveling to the West Coast, Canada, Europe, South America and the Caribbean. Otherwise, my life is average, which is not very exciting. When you see him, tell Cac Clarke that I think he is doing a swell job in reporting Class news." Thanks, Bill!

Robert E. Waterman, retired senior vice president, Schering Corp., and now chairman, New England Nuclear Corp. and director of several companies, notes: "We are leaving for our Florida home in several days and it does not seem practical to take a day off in this hectic week, even though the American House is a pleasant place." Bob and Elizabeth have a home on Spring Valley Rd., Morristown, N.J. 07960, and can now be reached at 920 Hibiscus Lane, Delray Beach, Fla. 33444.

Arnold R. Davis, 95 Orchard Lane, Berkeley Heights, N.J. 07922, advises: "Not able to attend this one but might be interested in future luncheons depending upon weather and driving conditions. Am well and still enjoying retirement. Keep busy working around the house and

garden. Visit Maine once or twice a year; also other interesting places. Do some reading outside of chemistry." Jeff retired in 1965 as manager of technical services in the rubber chemicals department of American Cyanamid Co., Bound Brook, N.J.

Writing from his home, 1105 W. State St., Trenton, N.J. 08618, **Abram E. Watov** replied: "Thanks so much for your letter concerning the '21 luncheon. Unfortunately, I suffered a heart condition this past summer and must leave for Florida the day after the luncheon is scheduled and cannot attend, much as I would like to. If you can arrange another meeting after May 1, 1970, I'd be glad to go and to bring Al Fletcher along. I am now retired from New Jersey State service and will have to spend my winters in Florida. Thanks for getting in touch with me." Abe had been chief of the standards and specifications division, New Jersey State Division of Purchases. . . . Regrets were received from **Edward L. Young**, 527 Wychwood Rd., Westfield, N.J. 07090, who has retired from the shipbuilding division, Bethlehem Steel Co. and mail addressed to **Abraham M. Aronson** at 52 Broadman Pky., Jersey City, N.J. 07305, was returned. Can you supply Abe's current address?

Busy beaver

The M.I.T. Club of Northern New Jersey, which your Secretary had a part in organizing, is entering upon its 35th anniversary year which opened with a reception for incoming freshmen, then a picnic, a dinner addressed by experts on the antiballistic missile situation and a tour of an Eastman Kodak processing plant. The club, which has been headed by four presidents from the Class of '21, more than represented by any other class, also has enjoyed the extended services of **Joseph Wenick** as treasurer, assistant treasurer and member emeritus of the board of governors longer than anyone else. Joe received the club's annual "Outstanding Alumnus Award," an engraved silver Revere bowl and is one of three members of the Class of '21 to be honored in a total of eight such awards. He has given generously of his time and ability to M.I.T. and the Alumni Association and was recognized in 1964 with the top alumni award of the Bronze Beaver, which has been bestowed upon five others of our Class, dating back to the first award in 1955. Joe is a member of the M.I.T. Educational Council and a regional vice chairman for the Caldwell-Montclair area of New Jersey. He has represented both the M.I.T. Club of Northern New Jersey and the M.I.T. Club of Virginia on the Alumni Council. His numerous activities have included participation in several past endowment drives and the Amity Fund; also as the general chairman of the first day-long guidance conference and symposium sponsored by the New Jersey club and the M.I.T. Educational Council. A native of New York City, he prepared for the Institute at Townsend Harris Hall and was graduated with us in Course X. As an undergraduate, he was active in the



Joseph Wenick, '21

Chemical Society. Following associations with William B. Noe and Sons and the Greist Manufacturing Co. as works manager for each firm, he became chief engineer of Lightoller, Inc., retiring in 1965. When he is not busy with philatelic matters, he still carries on a consulting practice and serves variously as chairman of the Service Corps of Retired Executives (S.C.O.R.E.) in his area; as president of the board of trustees of the Caldwell Free Public Library; on several committees of the Jersey City Chamber of Commerce, and in special capacities for the Small Business Administration. Dorothy and Joe have two sons, Richard, University of Cincinnati, an architect, and Martin, Brown University, a member of the U.S. Diplomatic Service and until recently the first secretary and consul, American Embassy, Prague. The Wenicks make their home at 37 Cedars Rd., Caldwell, N.J. 07006.

Via the mail box

It's too long a time since we have heard from **Walter E. Church**, 10943 S.W. Collina Ave., Portland, Ore. 97219, one of our famous group of West Coast architects and Fellow of the American Institute of Architects, who has now retired as senior partner of the Portland architectural firm of Church, Newberry, Roehr and Schuette. Walt sent a brief but welcome note saying: "We spend a lot of time at our beach

home at Arch Cape, Ore., and in travel. We were in South America last spring." It has been some time since Walt returned a '21 data sheet but, at last report, he and Bernice had six grandchildren. They have three married sons, Dudley F. Church, Reed and M.I.T., '46, Course X; William C. Church, M.I.T., '52, Course IV, and McGregor L. Church, Stanford and University of Oregon Medical School. Walt has been one of our stalwart newsgatherers and we hope he will resume his contributions to these columns.

Anne and **George Schnitzler**, 32 Gerry Rd., Chestnut Hill, Mass. 02167, write that, following the trip to the Grand Tetons and Yellowstone Park reported in the October/November 1969 *Review*, they viewed the Canadian Rockies from Banff to the Pacific Coast. George adds: "I am still actively playing tennis, but in doubles only." By this time, the Schnitzlers are doubtless in Florida at 1076 Venetian Way, Miami 33139. . . . **Thomas W. Bartram**, who retired in 1961 after 37 years as organic research chemist of the Nitro, W. Va., plant of Monsanto Chemical Co., moved last May from St. Albans, W. Va., to a new home at 9582 141st St. North, Largo, Fla. 33540. Billie and Tom are near neighbors of Marty and **Bill Ready** in Clearwater. We wonder if all four of them see Olive and **Ollie Bardes** and play golf on Ollie's nearby championship golf course, the Bardmoor Country Club in the Largo-St. Petersburg area. Who will volunteer to write us? . . . **Joseph G. Kaufman**, to whom we expressed sympathy from the Class on the passing of his wife in 1968, writes that he married the former Lillian Kohen and they make their home at 923 Essex Rd., Daytona Beach, Fla. 32017. Joe retired in 1955 from the J. G. Kaufman Co., his own appliance business in Boston. All good wishes!

Maxine and your Secretary's daughter, Mrs. Joe Blanton of Grand Rapids, Mich., writes: "At a meeting of the American Physical Therapy Association here, I had the pleasure of meeting Mrs. Roger Chutter. She and her husband have moved from East Lansing, Mich., to East Grand Rapids." Our Eleanor and Karen Chutter are both graduates of the Simmons College course in physical therapy. Roger Chutter, son of Marion and 50th Reunion Chairman **George A. Chutter** of East Dennis, Mass., has been doing graduate work at Michigan State University. It is a source of pride to see the close friendships of members of our Class extend to the next generation. . . . **Joseph C. Morrell**, Dorset 5B, 90 Bryant Ave., White Plains, N.Y. 10605, sent a personal note during a recent visit to the Basin Harbor Club on Lake Champlain, Vergennes, Vt. . . . **Donald G. Morse**, 44 Lowell Rd., Wellesley Hills, Mass. 02181, says he and Kim have returned home after a brief vacation in Whitefield, N.H.

Thai princess honored

Via Donald P. Severance, '38 and G. Peter Grant, '35, we have an interesting letter from Captain Adul Pinsuvana, '59

Royal Thai Air Force and secretary-treasurer of the M.I.T. Club of Thailand, which says, in part: "The M.I.T. Club of Thailand held a dinner on September 6, 1969, in the Terrace Room of the Siam Intercontinental Hotel, Bangkok. The guest of honor was Her Royal Highness Princess Ubolratana (Mahidol) who should now be at M.I.T. for her first semester. A record number of 40 alumni and 28 guests made it the biggest party we have ever had. Among those present were 33 Thai, five American, one Chinese and one Burmese alumni. Phra Bisal Sukhumvit, '23, Club President, recounted some stories concerning the Princess' grandfather who was at M.I.T. with the Class of '21. A toast was proposed to the Princess and an M.I.T. sailing jacket and T-shirt presented to her. After a reply by the Princess, the members and their wives and guests were entertained with slides of buildings and scenes from M.I.T. and Boston. It was a very warm occasion and it was enjoyed tremendously." Our distinguished classmate, Prince **Somdet Chao Fa Mahidol of Songkla**, father of the current King Bhumibol Adulyadej, was graduated with us in Course VII and contracted his fatal illness in 1929 while pursuing matters concerning the public health of his country. In his memory, the Class of '21 held a reception and dinner for his granddaughter, Princess Mahidol, now M.I.T., '73, in November, 1968, while she was still at Concord Academy. We are delighted to learn that her grandmother, SRS Princess Sangwan Mahidol, is well and living in Thailand.

Fiesta 1970

The Class of '21 has no official plans for an interim reunion next month in conjunction with the annual Fiesta of the M.I.T. Club of Mexico City, scheduled for March 12 through 14, but we hear that several of our group may attend and extend in person congratulations from the Class on the award to the Club of the certificate of excellence presented by the Alumni Association at the Alumni Officers' Conference last fall. We have received the preliminary Fiesta program, announcing that Jim Killian, '26, and Mrs. Killian will be the honored guests this year. Featured in the tentative plans are a *charreada* and a new site for the *Noche Mexicana* on the grounds of Chapultepec Castle. If you are making the trip for the first time, we shall be glad to assist, especially with plans for additional travel in our sister republic. We hope you will write us about the Fiesta and the '21 people in attendance for these columns.

Leisure bound

George F. Lull, M.D., retired medical director of Cook County, Ill., says he has a new home address at 2440 N. Lakeview, Chicago, Ill. 60614. . . . **Ralph R. Evans**, retired from the manufacturing department of Simplex Wire and Cable Co., Cambridge, reports a move from Melrose, Mass., to a new home at 33 Alenclair Dr., Amesbury, Mass. 01913. . . . **Robert R. Whitehouse** has apparently given up his home in Unity, Me., and is

making his permanent retirement home at 633 70th Ave., St. Petersburg Beach, Fla. 33706. Right, Bob?

Edna and **Philip T. Coffin** are living at Apt. 103, 1950 Gulf Shore Blvd., Naples, Fla. 33940, but we have no word as to whether they still maintain their pre-retirement home in Mt. Lebanon, Pittsburgh, Pa. . . . **Richard J. Spitz** has moved from Mamaroneck, N.Y. and gives his retirement address as 100 Sands Point Rd., Sarasota, Fla. 33577. . . . Eleanor and **Ralph E. Ferdinand** have chosen a spot in the Bay State for their retirement home and give a new address of Arrowhead Park, Brewster, Mass. 02631. Ever see Don McGuire in East Brewster, Fritz? . . . We have an unconfirmed rumor that **Robert M. Felsen-thal** has retired as president of the Exmet Corp., Bridgeport, Conn. Bob has made his home at 7 Woodcock Lane, Westport, Conn. 06880. . . . **Raymond C. Fisher**, 10215 Belgrove Court N.W., Seattle, Wash. 98177, retired from Boeing Airplane Co., where he was a research engineer on guided missile development. He is married and has no children.

Please help maintain this column with a letter about whatever comes to mind—so long as we can print it—plus your photo on a 5" x 7" glossy print or good equivalent suitable for use with the Review's high quality paper. You and your wife have a date for Homecoming 1970 on campus in Cambridge, Monday, June 15, next, with an informal class dinner the night before. You both have a real eventful date for our one and only 50th reunion from June 10 through 14, 1971. We hope to see you on both occasions and especially urge that you "Join '21 in 'Seventy-one!"—**Carole A. Clarke**, Secretary, 608 Union Lane, Brielle, N.J. 08730; **Edwin T. Steffian**, Assistant Secretary, Steffian and Bradley, Inc., 19 Temple Place, Boston, Mass. 02111; **Sumner Hayward**, Assistant Secretary, 224 Richards Rd., Ridgewood, N.J. 07450

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It just doesn't seem fair to all our classmates to be sitting in Buffalo in November with 65° golf-playing weather while the rest of the country suffers with snow and high winds. The message is that if you can't come to western New York to enjoy yourselves, at least write a few notes about what you are doing for the benefit of the rest of the Class and your inspired, ambitious secretary. We acknowledge that **Horace W. McCurdy** is right on the ball looking out for the best interests of M.I.T. in his desire to keep the Alumni constantly implicated and with responsibility for the future well-being of the Institute. All of us were thrilled to receive the message from our Class President, **Parke Appel** regarding the Reunion on Campus in June 1972. He also reviewed items concerning our 50th reunion gift and institute affairs.

We are sorry to learn that **Stu Dimmick** (Henry S.) is quite ill in the Chelsea Naval Hospital. We all hope for future good news. . . . We were saddened to hear of the death of **Frank H. Russell** of Needham, Mass., from cardiac difficulties following surgery. Frank was the retired manager of the shoe fabrics division of Westpoint-Pepperell. He thoroughly enjoyed the 45th reunion and attended many meetings and conventions in his industry. Mrs. Russell continues to reside at 179 Harris Ave., Needham, Mass. These notes are from his son, Lindsay Russell, '50.

M.I.T. is making the news these days through invasion of it's halls by students and outsiders. We are particularly well impressed by the statement of policy issued by President Howard Johnson and pleased with his unanimous backing by the faculty. It's difficult for us to align patriotism with cheers for our opposition, especially during the time of long casualty lists and no cooperation at the Peace Table.

We have an interesting article which was published in the July *IEEE Spectrum* concerning the use of electronics for nature photography. **Crawford Greenewalt** has used the equipment described to continue his series of excellent humming bird photographs.

We note that the Class of 1912 is publishing life histories of classmates. This would be an interesting activity for our group. The news coming in is much too sparse. How about a few of you sending in family information, hobbies and sports, travel, various business or professional positions and achievements and any interesting stories about your days at Tech or during our Reunions?

William G. Rapp is continuing to act as safety consultant for Standard Structural Steel Co. of Connecticut, a structural steel fabricator and erector. . . . **Eastman Smith** of Mt. Home, Ark., is continuing his research on improved eyesight testing and on improved violins. He states that he is very busy although retired and suggests that we come to visit beautiful north Arkansas. . . . **G. Dewey Godard** who has also been our faithful alumnus reports from Marblehead that he is still spending his time puttering around home and doing some traveling. Dewey retired in 1959 at the age of 60 after spending over 37 years in the Safety Test Department of the Boston office of General Electric Co.

Abbott L. Johnson of Muncie, Ind., has returned from spending July and August escorting his ten-year-old granddaughter through Europe. They visited Iceland, Norway, Sweden, Denmark, Finland, Russia, Germany, Holland, Belgium and Ireland. We will hear all about it at our next M.I.T. gathering. . . . **Walter W. Boyd** of Bethesda, Md., writes that he is still proud of his Master's Degree in Electrical Engineering from the Institute and that he was one of the founders of Tau Beta Pi Chapter at M.I.T. . . . **Florence Stiles** of

Amherst has retired and is living at Havenwood Retirement Community. She is working on a genealogy for the Trefthen and Sterling families which is associated with the history of Monhegan Island, Maine and New Castle, N.H. She also has come in to the history of the fishing industry in Cornwall, England. Sounds like an interesting venture. . . . **Thomas M. Taylor** reports fair health for himself and Mrs. Taylor from Naples, Fla. They do not do much traveling but ask that friends stop in at 660 Bollard Place. . . . General **Dwight F. Johns** of Piedmont, Calif. is completely retired but states that he is busier than ever.

We send our sympathy to the family of **Joris M. White** of Franklin, Tenn., who died July 20, 1969.

Changes of address: John G. Campbell, Heritage Village, Southbury, Conn.; Stephen B. Niele, South Yarmouth, Maine; C. William Perkins, Fort Lauderdale, Fla.; David R. Shotwell, Reading, Pa.

Now off we go to Miami for an electrical contractors meeting with hopes of seeing a few of our classmates while in Florida, especially our tennis enthusiast, **Frank Kurtz**.—**Whitworth Ferguson**, Secretary, 333 Ellicott St., Buffalo, N.Y. 14203; Oscar Horovitz, Assistant Secretary, 45 Gerard St., Boston, Mass. 02119.

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Felipe Diaz Ossa writes us from Chile: "Herman Plaza, a fellow countryman and also a Tech man '22, wrote me last week that in *Technology Review* of July/August you were asking for my last address because P.O. Box 84D was not working any more. Yes. After 20 years of working in Zig-Zag . . . I was forced to retire and I am working now at Editorial Lord Cochrane, (address below) a similar concern to Editorial Zig Zag. . . . I am working in editorial and publicity matters and I will only be too glad of being of any service to any Tech man in these matters connected with Chile."

James A. (Pete) Pennypacker writes: "My son went to M.I.T. a number of years ago ('60 VI S.B.), and, like his dad spent many pleasant hours at Wellesley. In his senior year his engagement was announced and his bride has become a lovely daughter to me. She has an uncle named **John Allan Abbott**, who is a classmate of ours. Because of our relationship, 'Reds' Abbott and I have been together several times recently. He is anxious to retire, but his company knows a good man and is apparently reluctant to separate itself from the present Chairman of the Board, J. Allan. . . . Last week I attended a joint meeting of the Deep River Historical Society and the Old Saybrook Historical Society. . . . There I met **Art Belyea** who is just fine and full of energy. . . . Keep up the good work, Tom, and I hope you will uncover several assistants to help Art Davenport write the class history." Thanks, Pete,

for the news item. Also, J. Allan Abbott, why don't you contribute something in the way of news sometime?

Horatio Bond, who told us sometime ago that he retired from the National Fire Protection Association, is operating as a consulting engineer in Boston (see address below). He tells us that his home is still Hyannis Port, Mass., (spelled as two words—all the time we thought it was spelled "KennedyBunkPort"). . . . We can now announce with pleasure that **George W. Bricker** has accepted appointment as 50th Reunion Chairman. We class officers are delighted as there will be plenty of work to do in connection with this affair two or three years hence.

Robert C. Sprague, former Vice Chairman of the Board of the Mitre Corporation, has been elected Chairman of the Board, succeeding Dr. James R. Killian, Jr., '26. Sprague is founder of the Sprague Electric Co., of North Adams, Mass., and is Chairman of its Board of Directors and Chief Executive Officer of the company. . . . **Winchester G. Blake** writes: "Having seen the U.S. and Canada thoroughly this spring we visited England, Scotland, Denmark, Sweden and Norway, including a drive through rural England of 1,000 miles and a week in London with friends." . . . **Joseph H. Cox** writes, in part: "I spent my active career with Westinghouse Electric, ending as Engineering Manager of its Sunnyvale, Calif., plant from which I was retired . . . at 65 in 1959. Following that I did a statistical study for the Pacific Maritime Association which took two and one-half years. Other than that I have kept very busy . . . (including) some traveling—one trip was around the world."

We regret to make note of the passing of **Stephen A. Days** in Hyannis, Mass., on June 24, 1969. We are also sorry to be notified with such a long delay. Stephen served in the U.S. Navy in the 1917-1919 World War and after graduating from the Institute went into the real estate business in Bourne, Mass. During W.W. II he was construction superintendant on a number of important Army and Navy bases.

Here are a few address changes: **Horatio Bond**, 60 Batterymarch St., Boston, Mass., 02110; **Felipe Diaz Ossa**, c/o Editorial Lord Cochrane, S.A., P.O. Box 611, Santiago, Chile; **Daniel B. Coleman**, 23 S. Elizabeth Ave., St. Louis, Mo., 63135; **David B. Joy**, Provincial Gardens, 6005 Midnight Pass Rd., Sarasota, Fla., 33581; **Hyman F. Marshall**, 10300 W. Bay Harbor Dr., Bay Harbor Islands, Fla., 33154; and last but not least, **Class President, Howard F. Russell**, 10026 Waikiki Dr., Sun City, Arizona, 85351.—**Thomas E. Rounds**, Secretary-Treasurer, 4 Deer Hill Dr., Danbury, Conn., 06810

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The October meeting of the Alumni Advisory Council was graced by the presence of **William H. MacCallum**. He joined

Messrs Ambach, Lehrer, Knight, and Stewart in representing the class. Bill and Eleanor had driven in from the West Coast the week before to turn over their ten-year-old Mercedes to daughter Sandy—the senior MacCallums having acquired a brand new one complete with air conditioning, power steering, and other concessions to advancing years. En route they stopped in Albuquerque and called the **Max Ifields**. Surprisingly, they found them at home, probably resting up before taking off for another Mexican winter.

From Cambridge the MacCallums were flying to Montreal, then taking the Canadian Pacific to Vancouver (thereby seeing all the things they slept through on their way east to Expo), and so back home. It would seem logical that a man who has spent his whole life traveling, as Bill has, might just want to stay put in retirement. Not so. They're starting 1970 with a 30-day cruise of the Caribbean, and in all probability will follow that with a Mediterranean tour. No sedentary types, the MacCallums.

Chris Conway's work with the telephone company did not include a great deal of traveling but now, in his first year of retirement, the Conways have started to make up for it. From their new base in Louisiana they journeyed to New York, Nevada, Florida, Pennsylvania, and Texas. That's a good start. And in between Chris found time to make a major addition to their home, get in 3 or 4 rounds of golf a week, and play a lot of bridge with the Alexandria Duplicate Bridge Club. The Conways achieved sufficient proficiency to win a tournament last September.

Then, of course, there are those who retire one day and go right back to work the next. **Blanchard D. Warren** is one. Three years ago Nick retired as Pacific Sales Manager of Bird Machine, but it didn't take. He felt happier working, so now he's Sales Manager of T-K Co., in Portland, Ore. Haven't the slightest idea what those initials stand for, but in any event it's an outfit that makes pulp and paper mill equipment. . . . **Charles R. MacBrayne** is another. Charlie had a tough year in 1968. First Mrs. MacBrayne died, then Charlie had a coronary. Last March he retired as Board Chairman of Matthiessen-Hegeler Zinc Co., in LaSalle, Ill., and went to work for his son, Charlie Jr. At least he's spending part of his time helping get a newly established travel business off the ground. Evidently faraway places, once removed, agree with him. A recent medical checkup gave Charlie a clean bill of health.

Charlie Herrstrom is not quite as informative. We assume he's still helping Bill Sessions, '26, handle the patent problems of Cleveland, but you could never tell from his laconic two-word message: "Still percolating." Webster says that percolating means oozing filtering through. Is this some reference to the condition of Lake Erie? Is Charlie en-

gaged in anti-pollution activities to clean up that body of thick water? Possible.

The **Paul Cardinals** are still in demand as apartment sitters, even if their reputation as car transporters is somewhat tarnished. On the way to Houston for Thanksgiving with daughter Carolyn, Lorene and Paul stopped over in Pompano Beach, Fla., for a week "thanks to a friend who wanted us to occupy his Ritz apartment (Palmaire)."

Boynton J. Fletcher is leading a blameless life in retirement, or at least partly so. What part is not specified. He says: "Since retiring two and a half years ago I have led a peaceful and relatively blameless life of travel, cabinetmaking, gardening, and spoiling my ten grandchildren." (And then a bit of social comment.) "I must admit a feeling of relief at being outside of the mainstream of world events which our generation managed to louse up pretty thoroughly during its days of maximum activity. There seems to be some reason to hope that our children and their children will correct some of the worst of our errors." A note of hope in a time of dissent. Curly is also the bearer of ill tidings. "On our return recently from a long trip to Greece and Italy I learned that our classmate **John Castle Byrne** died on September 19. Jinny had been ill for years, and his wife writes that the end was mercifully peaceful. He is survived by a son and daughter in addition to his wife, Kathryn." The sincere sympathies of the Class go to the Byrne family.

W. Carleton Bartow did his second tour of duty last fall with the Massachusetts Bay United Fund as a member of its "Executive Task Force." He was loaned for the duration by Polaroid, for whom he is a purchasing consultant. These men go through an intensive course of training at Harvard Business School before the campaign, and if Carl goes through many more he'll probably be considered an alumnus. Many a man has gotten on Alumni Fund rolls with a more tenuous connection than this.

Dr. Samuel C. Prescott, long-time Professor of Biology and former Dean of Science, and William L. Underwood (Underwood's Deviled Ham et al), combined their talents many years ago to revolutionize the food industry. Now an Underwood-Prescott Professorship is to be established at M.I.T. the first endowed chair in the field of food science in this country, and among the members of the sponsoring committee are **Charles A. Thomas** and **Philip K. Bates**. They add lustre to an already distinguished group.—**Henry B. Kane**, Secretary, Box 177, Lincoln Center, Mass. 01773

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Many of you have had notes from **Ed Kussmaul** asking assistance in getting a good turn-out from your area for the

reunion next June; it is hoped that you have already answered in the affirmative. By the time these notes appear, all of you will have had the first notice regarding the reunion as a follow-up to President Spiker's letter. It is hoped that you will react immediately to each memorandum.

Some of the "Old Faithfuls" continue to correspond via the M.I.T. Alumni Fund Office, and this is greatly appreciated by your secretary. . . . **Charles Cooper** continues to enjoy the small town of Northfield, Mass., and appears to find many ways to make himself extremely useful to the Planning Board, the Committee on Sewage Disposal, and the Chairmanship of the United Fund.

Carl Mabley from Huntington, W. Va., notes that he has retired as Vice President and Sales Director of Island Creek Coal Company and has set himself up in business as a marketing consultant.

Gil Delugach notes that he and his wife have just returned from a trip to the Orient. This was his first trip there and he saw many unusual sights. Gil was told in Bangkok that the King's daughter is attending M.I.T. He returned to Memphis in time to interview some prospective applicants for the Class of 1974. . . . **James Evans** reports that besides his son (M.I.T. '62), he now has two grandsons, one and three years old, living in the Boston area.

George L. Washington notes that he is no longer Assistant to the President of Howard University of Washington, D.C., having retired June 30, 1969. George is now heading the College Service Bureau with which 79 colleges are affiliated. He is located at 1026 17th St. NW, Washington, D.C. (between "K" and "L" Streets) and he invites you to drop in if you are in the Capital City.

After 44 years in the cosmetic soap and detergent fields, **George Fuller** is retiring from Colgate-Palmolive Company to start a new career, having founded the George H. Fuller Company, perfumery consultants. He plans to continue an active role in the field of perfumery. George started work as chief chemist and manager of a Harriet Hubbard Ayer subsidiary in April, 1926, moving to the parent company in 1929 as chief chemist, assistant to the production manager and to the perfumer. In 1943, he accepted the additional post of perfumer and also became vice president of Harriet Hubbard Ayer Laboratories.

When Lever Brothers acquired Ayer in 1947, George became cosmetic chemist and perfumer on the Lever Research Staff for the Ayer Division, and later became plant manager. After Lever Brothers sold Ayer, he joined Colgate-Palmolive as section head of perfumery with complete responsibility for the creation, control and use of all perfumery related materials, perfumery adviser to all international subsidiaries, and instructor to all perfumer trainees.

Thomas R. Camp shares this year's Samuel Arnold Greeley Award of the American Society of Civil Engineers. This award was given for a paper prepared jointly with David Graber, '65.—**F. L. Foster**, Secretary, Room 4-144, M.I.T., Cambridge, Mass. 02139

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On a rainy Sunday afternoon with gray and vicious looking seas we cannot, even with tongue-in-cheek, tell you about our beautiful ocean—particularly since this is the eighth day of a nor'easter with no let up in sight. However, we have built a driftwood fire in the study fireplace on the lower level, down away from the wild ocean roar and as we look into the multicolored flames we find that we have created an atmosphere for writing class notes. This atmosphere is clouded a bit by the discovery of two letters from classmates written quite some time ago that we have not used. What inexcusable behavior for a class secretary who is always crying for help! But news is always news in class notes if it has not appeared before, so we will disguise our error a bit and you will never notice it.

One classmate who always snows us is **Bill Edwards** with his perpetual calendar. Bill has been at it for 50 years so we have to wait for a new gimmick to give him space now and then—and leave it to Bill to find the Gimmick! Here's his latest release: "The perpetual calendar, originated in 1919 by Willard E. Edwards of Honolulu, is shown in *The Old Farmer's Almanac* for 1970 on page 71 under the heading Scientific Progress, 1968-69. This almanac gives a monthly weather forecast for the U.S.A. and is also known worldwide for its Americana. It has been published continually for 178 years. Page 71 says: "Dr. Edwards feels that this calendar should be adopted for each and every year, not only here but the world over." It was introduced in Congress this year in a bill asking its adoption beginning with 1973." Bill's idea would put the calendar manufacturers out of business—perhaps they have a lobby and that's why your calendar has not been adopted Bill?

A recent letter from **Bruce Powers** with a London dateline asked about current activities at the Institute which were hitting the headlines. We wrote Bruce of our own observations of the skillful manner in which President Howard Johnson and his advisors are handling the current trying problems. We will quote other parts of Bruce's letter. "We spent a very interesting summer working our way through the Soviet Union and the Iron Curtain countries with some experiences in Russia, Istanbul, and Czechoslovakia which carried 007 overtones. I will tell you about them when I see you. Doris and I are at present staying in London and working in the library of the British Museum—she in her field, 17th century English literature

and I, as the spirit moves me, on a translation of a work by a modern Soviet author. Apparently we brought our Arizona weather with us as we are told that this has been the clearest and mildest autumn they have ever experienced. So far I have not even worn a top coat, but no doubt, we'll pay for it later. Best to your family and my M.I.T. friends."

Another classmate who has not been on the scene recently brings us up to date. The last we heard from **Win Russell** must have been when he was in Formosa. Now he says, "My present job is Chief, Facilities Division, U.S. Army Munitions Command, Dover, N.J. After thirty years in plant and industrial engineering and consulting I took a civilian job with the Army. Now after nine years I can retire, but have no plans to do so for the present. We do have a retirement home ready for future occupancy, a 1790 vintage "Cape Cod" on the Maine coast." Is it a secret, Win, where you have this seventeenth century house?—you say "on the Maine coast" which with all its promontories and inlets is thousands of miles long!

Time out—we've just had a call from the George Gilman's '23, who live over on the harbor to come over for a bit of late afternoon refreshment. We did—and found Associate Dean Emily Wick there too. Now having returned, we must find a way of winding up, and a letter from **Martin Staley** of San Antonio seems to do it. Martin has been a faithful contributor to the notes over the years. He says: "For two years I was involved in the design and problems of the electrical, air conditioning and plumbing plans for the Tower of the Americas being built as the theme structure of HemisFair '68. . . . The Eiffel Tower is taller as a symbol than our Tower of the Americas, which is a 622 foot concrete shaft constructed in a continuous concrete pour by "slip-form," with a six-level steel framed "Tophouse" which was put together twenty-five feet above the ground, then hoisted into place at the top of the concrete shaft by twelve hydraulic jacks, lifting the million and a half pound "Tophouse" in ten days. Many of the buildings such as the Tower, which features a revolving restaurant at the top, the new convention center, the 10,000 seat arena and the Texan Institute of Culture are permanent buildings and will serve as a Civic Center after the fair." With this parting word from classmate Martin Staley in Texas, we realize that the day is done and it is time to rest—but the sea outside still rages in tones higher on the scale than you would think—about middle C if my musical ear hasn't failed me, at any rate in tones that will soon lull me to sleep. So cheerio until March and don't forget to write!—**George Warren Smith**, Secretary, Pigeon Cove, Mass. 01966

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I'll just start these notes by quoting practically verbatim from a great letter from



R. de Luccia, '27



G. D. Jackson, '27

Hank Kurt: "Back in 1927 the class secretary appointed me as correspondent for the new Course XVI-Aeronautical Engineering. Inasmuch as I was the first and only graduate that June, I did not feel very obligated to report my doings to myself! (Here follows a flattering comment on the 1927 class notes. Thanks.) We have retired and all this summer my do-list has carried a note to make a report to you at last. At supper last night I told Louise I would surely write today and put in a note about **Erik Hofman's** surprise visit to us this summer. A few moments later I found that Erik had scooped us again! He always did! (See October/November class notes.) . . . Right after graduation I designed the Kitty Hawk airplane. We sold 39 of them and last year I was told there are three still flying. During the depression I was chief engineer for the Viking Flying Boat Co. We sold eight to the Coast Guard—pretty good for the depression? Civil flying and sales took me to 1940 when I joined the Grumman Aircraft Engineering Co. There I became the chief Joat—jack of all trades. I was in amphibian production, sales and operations, and a test pilot. This took me to the Caribbean, Portugal, and way out into the Canadian and Newfoundland bush. No one, who couldn't afford his own airplane, had more fun flying than I. I was in charge of our mobilization planning, and sub-contracting during the Korean war, then head of the quality control department. The last eight years my business card said: 'Director of VTOL development', but, alas, there was no development! It did bring me back into the forefront of aviation creativity where I have always been happiest. It's the best way to stay young. The whole country is badly delayed on vertical-take-off. We can have it today at 400 knots or better, if we'd only stop the everlasting studies and make some small ones, find out how they crack up, and get on with the show. . . . I was a member of nine technical so-

cieties and on the board or quite active on committees in most of them. I enjoyed my membership in the Society of Experimental Test Pilots the most.

"I flew actively—from Jennies to jets—then illness struck me down. From June 1968 to April 1969 I worked only two months. The last episode involved four months in the Mayo Clinic hospital, one full month on the critical list, a mental black-out for nearly three months, and a painful and long recovery involving three dialysis treatments and open heart surgery to install a mechanical mitral valve. We are recovering well and on schedule—still counting and all systems Go. . . .

"During that time I became 65, so I am now retired here and living in sparkling Down East Maine Coast beauty and constant laughter. As Erik said, we have a summer cottage on our own island, and a shore house for the winters, and they are only a half mile apart. . . . I married Louise Lovejoy of West Newton, who is (and here follow some most flattering comments about Louise.) Last winter when I had my head, both shoulders and one leg in the Pearly Gates, she had my coattails with her heels dug in and pulled me back on this side much to the surprise of the doctors. . . . Our best friends are our fine son and daughter and their five sons. . . . So-o-o, after 42 years I have reported!" . . . Many thanks, Hank. The report was worth waiting for. Hanks' address is Franklin T. Kurt, South Brookville, Maine 04617.

Robert de Luccia has concluded 18 years with Pacific Power and Light Company to become president of the Oregon Graduate Center. Bob's career with PP&L began when he was named vice president and chief engineer to direct the development of the hydroelectric projects on the Lewis River in southwest Washington, including the Swift project dam which was the highest earthfill structure in the world when completed in 1958. He was named Oregon Engineer of the Year in 1962 and holds the Goethals Medal of the Society of American Military Engineers for outstanding engineering achievement. Bob was also a chairman of the U.S. Committee on Large Dams, and a consultant to the W.P.B., the Atomic Energy Commission and the Air Force.

Glenn Dale Jackson Jr., a vice president of 1927 and certainly one of our most devoted classmates, has died suddenly of a coronary aneurysm. He had completed a two-month assignment for the International Executive Service Corps in Chile as a textile consultant, returning to his home in Amherst, N.H. on December 12. His whole family was with him for Christmas but, after a painful night, he was taken to a Boston hospital the next morning and died that day, the 26th, following an operation. On the 28th, a private funeral service was held in the library of Dike Arnold's home in Wellesley Hills, with just the family present.

Glenn's interest in our Class and in M.I.T. will seldom be equalled. By our Class, he will best be remembered as a four-time chairman of our reunions, and in each case the job at hand received the benefit of his irrepressible energy. In rapid order, he was vice president of the M.I.T. Alumni Association of Rhode Island, president of the M.I.T. Club of Northern New Jersey, and president of the M.I.T. club of New Hampshire. While he was in Iran for the I.E.S.C., he remained in charge of Alumni Fund activities. A mainstay of the class notes, there was never a year that Glenn didn't write modestly of his own activities, usually including something about others in the class, and also often including a note about a foreign country he had visited.

Virtually all of Glenn's career was spent in the textile business; he was with the U.S. Finishing Co. of Sterling, Conn., for 17 years; in 1946 he went to Germany for the government to study dyeing and printing plants there and his report was published, *German Methods of Finishing Rayons*. Three years later, Glenn became associated with the North Carolina Finishing Co. and moved his home from Connecticut to Summit, N.J. He founded the Nashua Finishing Co. in 1954 and then settled in Amherst, N.H. Nine years later Glenn went into his textile consulting work, including the tour to Iran which kept him away from the 40th—"Breaks my heart," he wrote. Instead he sent us all the famous letter, half Arabic, urging support of the class gift.

Glenn's wife, Betty, survives him as do their three children: Glenn, 3rd., '55,

Wanted: Class of 1927 ring. Any size, any stone. Robert S. Woodbury, Room 14-N409, M.I.T.

chairman of his 10th reunion and who works with Rohm & Haas; Robert, a New York architect; and Ann, a teaching graduate, now working in the M.I.T. Instrumentation Laboratory.

We have learned with regret that **Dike Arnold's** wife, Eloise, died December 4, after an illness of two years. Many of us remember her from our undergraduate days as Eloise Douglas, so often with Dike from his sophomore year on. They were married in Boston in November 1929 and celebrated their 40th wedding anniversary this past fall. Both Arnold sons are married and live nearby: Douglas in the Town of Sandwich on Cape Cod; Richard in Bedford. There are four grandchildren.

The October 3rd issue of *Life* magazine had a lead article on "The Grace of Ballet", featuring the multi-image photography of **Gjon Mili**, including a fabulous front cover picture. . . . **William A. Zisman** is a co-author of a paper "Adhesion: Mechanisms that assist or impede it." Copies are available at the Cornell Aeronautical Laboratory Library, P.O. Box 235, Buffalo, N.Y. . . . **Helmuth G. Schneider** is now teaching part-time at the Newark, N.J., College of Engineering. . . . Professor **Theodore Bogardus** will conclude his teaching at Baldwin Wallace College in June, to devote his time to his real estate interests near Cleveland, Ohio.

"Have enjoyed retirement now for two years", writes **Dave Knox**. "We spend the winter months in Lake Worth, Fla. but maintain our summer address at home in Huntington Woods, Mich. Highlight of last winter was a surprise visit with Mary and Mark Greer, '26, in Naples, Fla. Our apartment in Lake Worth is 223 So. Palmway. If in that neighborhood, please come to see us." . . . In a surprise meeting, **Jim Lyles** and **Anson Rosenthal** and their wives found themselves on the same jet to London last summer. Both couples had great trips in the U.K. . . . We were glad to have word from **George Brady** bringing us up to date on his activities: "I retired September 1968 from my position as assistant director, science and technology division, Institute for Defense Analyses. I am continuing to do some part-time work as a consulting engineer in the aerospace field. In addition I am serving

a second year as president of the Federation of Citizens Associations of the District of Columbia." . . . **John P. Vinti**, whose special field is the dynamics of satellite orbits, has become a member of the editorial board of the journal *Celestial Mechanics* and is now a visiting associate professor of the M.I.T. Department of Aeronautics and Astronautics. . . . We have received an address for **Elmo W. Landers** at Apt. A-314, 6166 Leesburg Pike, Falls Church, Va.

We have just received word of the death on November 15 of **Edward D. True** in a letter from his wife, Anna. To quote the letter: "Ed suffered a stroke last February which paralyzed his left side, but he recovered sufficiently to go back to work for several hours each day and was able to keep the books for our store. Also, in July we attended the Lions convention in Tokyo and visited Taiwan, Hong Kong and Honolulu. When we returned, he could walk without a cane and was driving his car daily. His last siege came unexpectedly and was attributed to a heart attack." It is sad to record the death of this well-liked and respected classmate. Time does not allow fuller details but these will follow in the next notes.

Twenty-five years ago we reported the marriage of Miss Katherine Emery to Lt. P. C. Eaton USNR. Oscar Cox was general counsel of the Foreign Economic Administration in Washington.—**Joseph S. Harris**, Secretary, Box 654, Masons Island, Mystic, Conn. 06355

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By the time these notes are in print, each of you will have received an up-to-date listing of the Class with current addresses. If anyone is left out of the listing, is listed erroneously, or didn't receive his copy, please write promptly to Jim Donovan or to your secretary. It is our sincere hope that this listing will stimulate more correspondence among you. However, don't let this be a substitute for class news—we are all interested in what you are doing.

A recent article, "Noted Scientists," in an Esso Research publication describes the professional career of **Bill Sweeney**:

"Bill is known for his technical accomplishments in a wide range of fields including general petroleum processes; hydrogenation; polymerization; alkylation; hydroforming; fluid catalytic cracking; general petroleum products; and aviation petroleum products, including aviation gasoline, jet fuel and synthetic lubricants for jets. Two of his U.S. patents cover methods for petroleum exploration. Bill was chairman of the U.S. National Committee for the 1963 World Petroleum Congress and was vice chairman of the Permanent Council of the World Petroleum Congress from 1962 to 1967. He joined Jersey Standard in 1929 at the Esso Research Laboratories in Baton Rouge and became manager of the Baton Rouge labs in 1934. He served as a vice president of Esso Research and Engineering Company from 1947 until his retirement in 1963."

The *Atlanta Constitution* of September 29, 1969 carried the news that Georgia Tech had appointed **Robert S. Woodbury** to the chair of Callaway Professor of Social Science.

In a letter to Jim Donovan, **Ed Walton** gives expression to his sentiments regarding current events at the Institute. In his closing sentence Ed declares "We must continue to support the Institute so long as we feel the best possible job is being done in a very difficult situation."

Gus Solomons ran for City Council member in Cambridge, Mass., in November 1969. Although he was not elected to the post on this occasion, Gus has served for ten years on the Cambridge School Committee and as vice chairman of that committee for two years. Among his various distinguished appointments, Gus is a Trustee of Cambridgeport Savings Bank, on the Advisory Committee of Northeast Federal Savings Bank, is a member of the Corporation of the Mount Auburn Hospital, on the Executive Board of the Cambridge Council, Boy Scouts of America, and is engaged in several other social benefit activities as well.

A news release of November 1969 from Bell Telephone Laboratories datelined White Sands Missile Range, N.M. informs us: "**Noel C. Olmstead** of 8726 Marble Drive, El Paso, Texas recently retired



N. C. Olmstead, '28 F. N. Dickerman, '30

from Bell Telephone Laboratories after a Bell System career of more than 40 years. He was a member of technical staff at the White Sands Laboratory, here. He began his Bell System career with the American Telephone and Telegraph Company's Development and Research Department, which later became part of Bell Laboratories. He initially was concerned with radio transmission studies and later with design and development of transmitters. During World War II he worked on electronic bombing and navigation equipment. In 1948 he turned to military electronics work, including the development of weapons control equipment for the Navy's first guided missile cruisers. He had been at the White Sands Missile Range since 1961."

Louise and **Ernie Knight** in a post card message to Florence Jope gave a very brief account of a trip in the Orient that is worthy of a much fuller account: "... are having a wonderful trip. Originally intended to be to Japan and back by freighter but due to changing schedules has extended to Yokohama, Pusan Korea, Sasebo Japan, Hong Kong, Subic Bay and Manila, Qui Nhon Viet Nam, Thailand, then Hong Kong again from where we fly to Japan for our sightseeing. Freighter travel is wonderful—lots to see on land and in ports. Talked to **Shikao Ikehara** in Tokyo and hope to see him when we return. Went to Santo Tomas yesterday—some difference from what I saw when it was retaken in 1945. Hope we can get together this winter."

In the previous notes we promised to continue **George Bernat's** account of his world travels with wife, Ruth: "Also on this tour (South America) we got a good idea of what real inflation is. In Buenos Aires over the weekend that we were there the peso was devalued by about 5 per cent and prices went up accordingly. Because of this rampant inflation, no one wants to keep money—the people buy things as fast as they can, which, I suppose, feeds the inflation and makes it worse. However, with a good government I could see a great future for Brazil. 1967—We toured a large part of Africa. We visited Senegal, Ivory Coast, Ghana, Nigeria, South Africa, Mozambique, Tanzania, Rhodesia, Kenya, and Uganda. There is too much to talk about in one

letter. Suffice it to say that I thought that this trip and one we took to the Far East in 1961 were the greatest. I would strongly recommend that anyone who can should take this trip. There are several tour companies that conduct 'guided tours' like the one we took, at reasonable costs. Physically, it is a fairly easy trip because everyone speaks English there and facilities are good. Each country is different and there are great things to see in virtually every country—scenery, people, different cultures, and above all, the animals. We visited about eight animal reservations and saw about 30 to 40 different kinds of animals in their natural habitat—lions, baboons, elephants, giraffe, impala, wildebeest, crocodile—you name them, we saw them. Sometimes singly, sometimes in herds. We saw about 120 elephants coming to a water hole in Wanki National Park, Rhodesia. There were babies, young ones, and all the way up to old bucks. It took this herd about 30 minutes to pass us as they came from the bush to the watering hole. It was at sunset and the sight was really awe-inspiring. We saw a pride of lions (about twenty, including cubs and lions and lionesses) in the Nairobi reservation, within four miles of the center of Nairobi, with no fences or anything to keep them in if they wanted to stray. However, they know where they are safe and very rarely leave the reservation. The whole trip was simply great."

It is with deep regret that we must record the death of **Harold C. Tingey**, Course V, on August 22, 1969 at Nutley, N.J. Harold was Research Chemist with U.S. Rubber Co. from 1929 to 1962. He leaves his wife Ruth and two sons.—**Walter J. Smith**, Secretary, 209 Waverly St., Arlington, Mass. 02174

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I regret to inform you that **John H. Foster**, Course XV, passed away suddenly on May 5, 1969. He is survived by his wife, Marion, and three children: Mrs. Dorothy F. Anderson of Minnesota, John S. Foster of Boston and David R. Foster, a student at Swatmore College.

Bill Aldrich, who has regularly attended past reunions, was unable to attend our

40th in Wianno. He writes in his biographical notes that shortly after graduation, he went to Wyoming to work a few days in a lumber yard. Due to some accident, shortage of help developed and he found himself permanently employed. In 1938 he assumed full management of the concern and expanded its activities to include most products used in the building trade; the firm branched out into Montana. He has five children, and two grandchildren. Bill would welcome visits from any classmates traveling through Montana. This year he has enjoyed visits from Gus Stein, John McCasky and John Hallahan.

Vincent V. Gardner of Belmont, Mass., writes that after graduation, he had a number of jobs in Boston, Fall River and New York as an industrial engineer. In 1950, he went into the hospital field; he presently is administrative engineer of Beth Israel Hospital, in charge of the functional phase of the institution. He is married and has three children. . . .

M. E. Powley, Jr., reports that upon graduation he went into the marketing phase of the petroleum industry and has had a number of positions in Boston, New York, Tulsa, Baltimore and Chicago. At present he is the Midwestern Manager of Cities Service Oil Co. and lives in Hinsdale, Ill., with his wife Dorothy. They have two children and six grandchildren.

Joseph L. Speyer reports that upon graduation he went to Illinois where he held a number of jobs in manufacturing and sales with unsatisfactory results. In 1932 he came back to Boston and changed his field to insurance which proved successful; at present he is a general agent for Berkshire Life Insurance Co. Joe is a past president of the Boston Chapter, Chartered Life Underwriters. His son, a 1960 graduate of M.I.T., holds a doctorate from Harvard (1968). He also has a daughter who graduated from Jackson in 1955 with high honors. . . .

Eric Bianchi, President of our Class from 1964 to 1969, has been very active in M.I.T. Alumni affairs ever since graduation. He reports that after a short association with Dewey and Almy Chemical Co., he joined Nasoneilan Regulator Co. in November, 1931. After twenty years in sales he was appointed director of engineering. In 1956, the company was

bought by the Worthington Corp. and Eric was promoted to vice president in charge of operations; he became president in 1960. In 1964 he was transferred to Worthington Headquarters at Harrison, N.J., in charge of International Planning. Worthington and Studebaker merged in 1967 and Eric became a director of planning at Corporate Headquarters in New York City. He lives in Summit, N.J., with his wife Katherine. The Bianchis have one child and two grandchildren.

Malcolm M. Hubbard, who was actively involved in our recent reunion activities, purchasing those colorful hats and souvenir glasses, is presently doing consulting work under the name of M.M. Hubbard Associates, Inc., himself as President. Mal has had a varied and colorful career. Upon graduation, he was associated with New England Tel & Tel until 1945 working in every state in which the company operated, both inside and outside the plant as engineer, maintenance man, supervisor, instructor, etc.

During the war, he had a leave of absence from the telephone company and was engaged on the development of microwave radar at the Radiation Lab, heading the Component Engineering project. He was later named Associate Director for Nuclear Science. In 1951, he helped form the Lincoln Lab at M.I.T. becoming Associate Director. In 1955 he resigned his post at Lincoln Lab and formed Hermes Electronics which merged with ITEX in 1960, Mal becoming Vice President and Director of Research. In 1962 he left ITEX and formed his present consulting firm.

The most difficult task of a Class Secretary is to get news items from classmates. If you fellows don't write to me and tell me about yourselves I'll have nothing to write about except the weather. Your classmates are interested in what you are doing. Please write! Best regards to all.—**Karnig S. Dinjian**, Secretary, Starlight Towers, Apt. 14-E, 6000 N. Ocean Blvd., Fort Lauderdale, Fla. 33308 (until April 1)

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Supplementing the report on **Fred Dicker-**man's retirement in the November issue

of the *Review*, we have at hand an article from the September 18 issue of *Machine Design* that describes in some detail Fred's considerable achievements as an aeronautical engineer. As indicated in the November Notes, during the years 1933 to 1955 Fred worked for the Chance Vought Division of United Aircraft. In the years prior to W.W. II, as chief of preliminary design reporting directly to the chief engineer, he completed the preliminary design of four aircraft, all of which won contracts from the Navy for the building of experimental prototypes. The best known of these aircraft was the Corsair which incorporated the famous gull wing configuration that Fred had conceived. The Corsair was the first production fighter plane to exceed 400 m.p.h. and more than 10,000 of them were produced.

During W.W. II Charles Lindbergh served as consultant to United Aircraft, flying certain missions in U.A.-built aircraft in the Pacific area and then consulting with U.A. engineers concerning their performance. As "father" of the Corsair Fred had numerous conferences with Colonel Lindbergh concerning possible ways in which this aircraft might be advantageously improved. In 1949 Fred was made chief engineer of Vought, a promotion which moved him rather completely from design work to administrative work. During his regime as chief engineer, Vought won contracts for the Regulus I and Regulus II, which were highly successful jet-powered guided missiles designed for surface launch for submarines. Also Vought received contracts for the F7U Cutlass, a tailless sweptwing fighter with two jet engines, and for the 1,000 m.p.h. Crusader fighter plane. It appears that in 1954 the Cutlass project ran into unexpected difficulties which greatly increased its costs. Early in 1955 strong disagreements developed within the corporate management as to how these problems should be solved, and in February 1955 Fred resigned as chief engineer of Chance Vought.

After leaving Chance Vought Fred decided to indulge his preference for design work rather than administrative work and became chief of preliminary design engineering at Lockheed's Marietta, Ga. plant which at that time was producing

the Boeing-designed B-47 and the C-130 Hercules. At Lockheed Fred initially worked on special purpose variations of the Hercules and later was chief advanced design engineer for the C-141 Starlifter. He also participated in the design of the gigantic C-5 (725,000 lbs.) prior to his retirement.

Origin of the Japanese Zero

You will recall that during the early part of W.W. II the unexpectedly effective performance of the Japanese Zero gave rise to a certain amount of adverse criticism of U.S. designers. In the *Machine Design* article it is pointed out that the Zero was actually based on a U.S. design. It seems that prior to W.W. II Vought acquired from Northrop an aircraft design which it embodied in a prototype designated V-151. The V-151 was entered in an Air Force competition that was eventually won by the P-36. When Vought failed to get a production contract for the V-151, it sold the prototype and rights to Japan. According to Fred "the Zero was made from that airplane."

Following in the footsteps of a rather considerable number of our classmates, **Parker Starratt** is planning to move from industry into teaching. As most of you know, Parker was our original class secretary and has worked for Bethlehem Steel for many years. He is presently located at the main office in Bethlehem, Pa. which makes it easy for him to prepare for his new career. More particularly, he is taking courses at Lehigh University which will lead to an M.B.A. degree, after which he plans to retire from Bethlehem, move to Rindge, N.H. and teach at Franklin Pierce College.

Parker is an amateur radio enthusiast (W3EYW) and a member of the radio/TV committee of the Council of Churches which arranges Sunday morning broadcasts of church services over station WGPA in Bethlehem. The Starratt's son Robert received his undergraduate degree from Colgate and is now a graduate student in neuro-biology at Washington University with research in psychiatry as his ultimate goal. Daughter Priscilla is a senior at Smith, a "first group scholar" and plans to do graduate work in government. Parker attended the M.I.T. Regional Alumni Conference in Philadelphia in

1968 where he met Greg Smith and Hal Spaans.

By an odd coincidence we have at hand this month reports on the teaching activities of two other classmates. Last summer **Willard Morain** taught a course in gas turbines and gas pipeline pumping in Teheran, Iran. After completing his teaching assignment, he and his wife spent some time in Australia visiting his wife's relatives.

Hal Spaans has worked for the Bell Telephone Company of Pennsylvania ever since he graduated from M.I.T. His current assignment is Engineering Supervisor-Training, which involves supervising the Company's "in house" engineering school that trains some 500 students per year. He also teaches a course in engineering economics at the Engineers Club in Philadelphia. In addition he is active in M.I.T. affairs as treasurer of the Delaware Valley M.I.T. Club and member of the Educational Council. The Spaans' son David obtained a B.S. at the University of Missouri, an M.S. at Drexel and is a professional in Information Science. Daughter Judith is studying nursing at Wesley College in Dover, Del. Hal reports that he and Marge exchange visits with Edith and **Hank Halberg** who live in Little Rock, Ark. where Hank is a groundwater expert with the U.S. Geological Survey. As previously reported in the Notes, the Halbergs are ardent bird watchers. Hal says he has also recently seen **Grange Schrader**, who works for Philadelphia Electric Co., and **Charley Abbott**, the latter at a Simmons College banquet at which they discovered that their wives were classmates. . . . **Ralph Rowzee** has been appointed president of the Society of Chemical Industry (Canada) for the year 1969-70.

Changes of address: Rev. William M. Ailing, 5110 Central Ave., Indianapolis, Ind. 46205; William W. Driscoll, 68 Ardmore Rd., Framingham, Mass. 01701; Donald C. Harrison, Box 104, Roxburg, Conn. 06783; Richard S. Whitehead, 836 De LaGuerra Terrace, Santa Barbara, Calif. 93103;—**Gordon K. Lister**, Secretary, 530 Fifth Ave., New York, N.Y. 10036

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Fortunately, a man seldom has to write a story of real misfortune, and extreme loss. Wednesday, October 16, I went to Lunenburg, Nova Scotia, to attend the funeral service of our long-time friend, **Bob Winters**. Fred Lehmann called me Tuesday afternoon, and told me of Bob's passing the previous Friday, in Monterey, Calif., where he was attending a business group conference. The immediate cause of death was a coronary thrombosis. I asked Fred if anyone was going to attend the services, and he said that he had counted on my doing it. I said that, of course, I would, and did. Burial was in Lunenburg, where Bob was born 59 years ago, the brilliant son of a commercial fishing boat captain. Just to

suggest that this was indeed a great man and statesman, I found the Canadian papers literally loaded with short bits on Bob's life and career, public and private. It would be futile for me to even try to eulogize such a man and it has been our pleasure to write his story in various forms, many, many times. While I was there, a gas station attendant told me: "the city, province, and nation are in shock at the sudden passing of this great man, known personally to most of us in this province." Note, please, that these folks were not ministers, physicians, lawyers, etc; they were folks right off the street. This is the first opportunity for any of this to reach the Class, and when you read this bit, Bob will have been gone three to three and a half months. But, it is still not too late to drop Eleanor a short note speaking of her great loss, and of your own feelings in the matter. I have, for the class, already written her a preliminary short note (from New York), and will drop another, very soon, in the name of the M.I.T. Class of 1933. To Eleanor our deepest sympathy and the tender love of us all in your time of sorrow.

Now comes the irrepressible **Don Fink**, who was awarded a special pin by his professional society, as one of 28 living past presidents of I.E.E.E., of which Don is now general manager. . . . Here comes another short bit, maddening because of the fact that it is short, and we never hear even a word from the subject, classmate **Herbert E. Grier**, President of CER Geo-Nuclear Corp. Herb is shown signing an agreement, for his own company, jointly with A.E.C. and the Austral Oil Co., stating their intention to detonate a 40-kiloton nuclear device 8,400 feet underground to release a natural gas formation. This is to be done near Rifle, Calif., a most appropriately named location; no details are available. Perhaps some nearer friends of Herb's can write him and ask for details.

The Bear Manufacturing Co. announces the retirement of **Charles (Chuck) Mac-Millan** from his position as chief engineer, after 20 odd years with the company. However, Chuck is being retained in a consulting capacity. We mentioned a few times ago, that Chuck and Helga made the Officers Conference, unannounced, then called on us in Exeter. It now turns out, what with the mandatory retirement, that Chuck is no chicken, and is probably older than I am, haw! Chuck holds a colonel's commission (retired) with the army, which may explain his locating in Rock Island. So, it turns out that I am just a boy. Further, Helga is not mad at me for not recognizing her in the LaSalle station, a few years ago. So, we accomplished something. Now, Helga, I now ask that you write me, to provide a little better overall job, and save Chuck's writing me, which he does once in a while.

Another old Course II M.E. comes up with a promotion; **Neil E. Hopkins**, erstwhile citizen of Maine and now of York, Pa., is now the chief product designer

of absorption systems, at the York Division of Borg-Warner. Hop was, 35 or 40 years ago, a real scholar, taking a master's after his bachelor's, and no doubt regrets, since then, not having gone on to the Sc.D. Hop went with York immediately after leaving the Institute, and has been with them ever since as engineer, chief of research, specialist in lithium bromide refrigeration absorption systems, and now, it appears, he is running this particular division, as chief product designer. He belongs to the Pennsylvania Society of Professional Engineers, and, the A.S.M.E. I know that Steve Crick will join me in congratulating Hop on his promotion, as he, like me, probably would never have received an M.I.T. degree were it not for Hoppy.

Now, as you read this column there are less than four little bits of years before before the 40th reunion, and, though you probably have not been contacted, you are counted upon for your share of the 40th gift to M.I.T. All contributions up to and including July 1973, over five years, are counted into the final total. Ellis Littmann is chairman, as you know, and his committee will be announced by our steering committee. I do know more, but hesitate to interfere with the other chap's business, so refrain from suspicious quoting, and predicting. I still need photos from the 35th; Bachli (that lunch costs little but the photo), Bentley, Bradley, Brashears, Lawrence Brown, Joe Carbonnel (I got the story, Joe, where's the pitcha?), Cashman, Duntley, Garbarino, Hodgdon, Ferd Johnson, Lindsay, Rhodes, Richardson, Roetting, and, Jim Welch. This is the last I ask for, men; you will be displayed as blanks come the 40th.

We are honored with a fine letter from **Bill Reed**, architect in San Juan. Bill acknowledges having been prompted by the Secretary, but explains satisfactorily. First, his lovely is named Guiliana, not Juliana, Italian, not Dutch, sezsee. So mote it be, Bill. As of then, "Both children are home", and, a niece is living with the Reeds, for the summer, and is studying Spanish at the university. Christopher will graduate from Caltech next June, and has spent the summer working on nuclear research at the Nuclear Center in San Juan. Guiliana, Jr. (?), took a course in advanced Italian at the university. She is called Sissa at home. The Italian bit is so that she can take a course in Italian literature at Vassar this fall, where she will be a sophomore. She expects to major in Italian renaissance. Well, with a native Florentine as the mater, I see no reason why this major should not be a "cream puff." Christopher will apply for graduate work at M.I.T. next year and, Bill, I am a neophyte at making suggestions as to how one proceeds to establish himself as a grad student. Why not write your old dean, and ask him for suggestions, and possibly a catalogue. Thus, I am truly helpless. With his linguistic turn of mind, and the ability to teach, it appears to me that he would be welcomed with

cheers. Golly, that looks like a real head start. Bill's firm of architects and engineers have built themselves a new building, in a more convenient location, and, they love it. He was reelected president of the local chapter of the A.I.A., last month, and, he is also on the Urban Design Committee for a Nuevo Centro de San Juan, a brand new center in the very heart of Metropolitan Puerto Rico, on a plot of about 200 acres formerly occupied by the navy as a relay station. The plot has been sold to the Commonwealth for a very nominal figure. Folks, please note that this is a most singular honor accruing to Bill and his firm, and a plum seldom available for casual handouts. It is further, a challenge to the skill and ingenuity of the architectural committee. I sure want to see it when it is finished. Bill mentions Governor Ferré, '24, an M.I.T. man and a Life Member of the Corporation, and further, a most able man. He spoke to the Puerto Rico M.I.T. Club in August and gave a fine talk. Bill, I appreciate your fine letter and, were it possible, I would sure get to Puerto Rico but, being retired is for the birds; some people can't retire and some others were always that way. But, with me I have not time enough to do half that which I should, in 1) M.I.T. affairs, 2) Angus Cattle breeding, and 3) attending Angus affairs country wide, and writing about it in the journals. A class secretary can make his job about anything he wishes and it is my aim to make the '33 secretary of real use to his class. This is in no way a boast; just an expression of determination. Best to your lovely, Guilianna, and you too Bill.

I have a short one from **J. Dyer Potter, Jr.**, who was to have retired from the Connecticut Highway Department, after 37 years. But, someone must have gotten out the check book, as J. Dyer is now an engineer with De Leuw, Cather and Company of Newark, N.J. Dyer, Jr., has been placed to work off his energies on the new I-95 bridge, New London to Groton, Conn. on engineering and inspection. The contractors group is a joint venture with Savin Bros., Inc; Perini Corp; and the Whaling City Dredge and Dock Corporation. The contract is around 65 million. J. D. expects that he will put in 3 to 5 years, then take a President Line ship around the world, and really relax. Many thanks, J. Dyer. We appreciate your thinking of us.

We have a fine one from one of our lost sheep, **Niazi I. (Musty) Mostafa**. I did talk about Musty before, but through a letter of his to Brigadier General Harper of the Class of '32. It is regrettable that our pal is not yet 100 percent well, as he is back in the hospital in London, this time for a slipped disc operation which he says is his last repair job; he will then be as good as new. We sure hope so, son. Musty strikes a familiar note in saying that he thinks the disc slip is a direct result of too much something while a wrestler at M.I.T. Surely, some of you will recall that Musty was dang well good, and I can prove it by admitting that I went to see him wrestle

with the Naval Academy and ordinarily I can stay away from wrestling with the greatest of ease. It still leaves me cold. Personally, other than Musty, boxing was and is, somewhat my failing and I can still picture Ed Goodridge getting his nose flattened regularly. Mrs. Musty, the lovely Mimi, is joining him in London, and they will stay there for about a month, then take a long trip back to Egypt via Scandanavia, Deutschland, Schweiz, Czechoslovakia, Italy, Lebanon, then home. With business appointments all along the way, he allows that the stamina will just have to hold up, as the trip is, at times, arduous. But Musty says that he has made it three times a year before now. The elder daughter of the Mostafas is married, has a daughter of her own and is teaching in Cairo at the American school. She is very happy with her architect husband, who has his doctor's degree from a German university. Their older son is working for the Foundation Co. of Canada in Toronto. Their younger son is now just returned from California, and is in charge of the citrus, mango, and avocado plantation, with enough acreage remaining in the family to make it pay. Their kind of socialism has reduced the family acreage by a large percentage. Musty says that at one time he tried raising Friesian milk cattle, but had to give it up because he made the unfortunate discovery that the job is full time, and not a plain hobby at which one might dabble. True, friend, true! I have been at it almost 25 years, and am now on the way out. Musty, I choose to call your bluff about your writing to and for us, later. Musty says that we ought to get a fairer picture of the middle east situation, from whence comes news to us which is usually "distorted, and exaggerated." Some of us admit that the U.A.R. does not get the finest press, though some of us had the idea that this is a result of its position in world affairs, whose press situation is seldom tops. I, and all your classmates are fair-minded citizens, and we would welcome your comments, Musty, though politics in the *Review* have never gotten very far. Further, in place of writing, you surely are welcome to drop in and see the cattle if there are any to see. Musty, it does me good to be able to report on you and the family. We knew you well, and we also remember the 25th, and your timely visit. The 40th is the next one, and we do hope that your calendar is marked for mid-June in the U.S.A. Many, many thanks for your very fine, and timely letter; our best to all the Mostafas.

Now, folks, we have a first time letter (to me, of course), from **Harold S. Farney**, S.M. in C.E. Harold is a graduate of Clarkson College, and was with us only one year. But, some of you civil engineers will remember him. Since M.I.T., he has been with the Corps of Engineers almost continuously, and has been associated with eight of the Corps Districts, in hydraulic and planning aspects of water resources development. Harold and the lovely Mary have three children, Linda, Brian and Sarah. Linda, a graduate

nurse from Kansas University, is married and has one son, and the family lives in Montana. Brian is a junior at Kansas University, and hopes to study law later. Sarah is a junior at Alaska Methodist University in Anchorage and is majoring in languages. In this great state of beautiful mountains, rivers, and lakes, Texas, the Farneys are reasonably active in professional, church, and civic affairs, and the joint hobbies are outdoor—sailing on inland lakes, hiking, mountain climbing, skiing, and photography. Harold, I cannot tell a lie; I do not expect to get to Alaska too soon. But thanks for the invite. To be sure, I almost made it two years ago, but my lovely Leona did not say "yes," said, "no, we will go to Hawaii," so there. Many thanks to you too, Harold. We do appreciate getting these first-time letters. How about more first time stuff, men?

A change of address follow-up gets us a fine note from **Robert (Bob) Rogers**. Bob was Course XIII, Naval Architecture, and at first he followed the sea bent, working at the Sun Shipyards at Easton, Pa. But the depression caught up with him, and he changed to Ingersoll Rand, and has been with them ever since, (Just like Westy). He has just retired, hence the address change, and after 33 years with I.R. Co. The Rogers-Doris Jones marriage has resulted in a two child family. Son Charles graduated from M.I.T. then stayed on for his Sc.D., and is now with the Air Force as a career Officer; this after taking a doctor's in physics. Daughter Connie, graduated from Wheaton, took graduate work at Washington University in St. Louis. Both children are married, but, no grandfather club for Bob, as there are no grandchildren as yet. In as much as it appears that this is another first timer, please allow me to express my most sincere thanks and approval of this new feature; new in that I have three first times already, with perhaps more to come. Every first timer could be a steady contributor, as is evident. How about the rest of the non-writers? Why not join the first timers club. If a few do, I will capitalize the name. And to you, Bob, personal thanks, and best to all the Rogers.

Walt Skees sends us a copy of a news item in the *Nassau Daily Tribune*, Bahamas, written about the Green Turtle Key, where Walt's Lodge is located. No word from Walt. So, Walt, that's all for you. You write me something, and we can consider it real friendly. However, this is not an advertising medium as such. I like this system of yours, Walt, but I fear that the Institute might get stuffy about it, were I to use it. . . . The Alumni Fund capsule situation is acute this month; We have only one, that from **William L. (Bill) Sheppard**, an aeronautical, XVI, written from his retirement home in Bradenton, Fla. Bill says that his first wife passed away in 1967 and he has since remarried, to a widow, and that they are living in Bradenton. Bill retired from employment with the Budd Company, of Philadelphia where he had been



Akin to an American rodeo, the charreada is a feature of the Mexico City M.I.T. Club's annual fiesta. This charreada photo, taken at last year's 21st Annual Fiesta, shows the Mexican participants exhibiting their expert horsemanship.

divisional vice president, and general manager of the Railway Division for over ten years. Bill does not say when he retired, but it appears to have been between 1967 and now. William, my boy, I personally appreciate your short, but sweet, message via the capsule. I am getting to be real fond of the capsule, no fooling, as it turns out that, with limited space, the writer really condenses his message for us.

By golly, the idea of writing to Classmate wives is sound, for sure. Now I start getting questions from them, or should I say one? I had, recently, a fine note from Dorothy (Mrs. Gerry) Kincade, Pittsburgh, asking for a list of addresses, so that she, in turn could send some 35th snapshots to those involved. She got the addresses quickly, and replied just as quickly to my short note of greeting, with Kincade news, though Gerry had given me most of it before this. I was quite surprised to find that Gerry is, besides a vice president of St. Regis Paper, the general manager of the container division, and he has 25 different plants to operate and keep profitable. He also holds many offices and committee responsibilities in the Trade Association part of the job. The Kincades seem to have found a compatible answer to the situation where both lost their life partners at about the same time. Dorothy was Gerry's secretary, and after a suitable period, they married, and are very happy in their new life. Gerry has four sons, and three daughters-in-law, and, six grandchildren. Gee, one of those sons seems to be shirking his duties, as he seems to have no wife. Please let it be known, here and now, that Dorothy is quite a gal, and writes a beautiful letter; one so personal and detailed as to family etc., as to make it impossible for me to use all of it, here. So, my lady, we all think just as much of Gerry as do all his employees, friends, and family. He has always been one of our favorites. Please do write again, and often, and other ladies of the class, won't you drop us a line in such known cases where hubby is reluctant to reveal his self pride (too modest?). We just have to have news of classmates, no matter where it originates, and I am positive that many of the girls will enjoy telling the family story, and well, no doubt.

Monday, October 27, Ellis Littmann's Steering Committee for the 40th Reunion Class Gift, met at the M.I.T. Faculty Club for more and more spade work. In attendance were; Ellis Littmann, chairman and vice president, vice presidents George Henning, Westy Westaway, Fred Murphy, Class Agent, Robert White. Charlie Bell came from Rhode Island to join us, as did last and surely not least, our president, Jim Turner, now also from Rhode Island. Besides your scribe, Ken Brock represented the Institute, accompanied by a very capable young man, whose name now escapes me. It runs in my mind that I have missed one other '33 man, and if this is so, I ask that he write me in February. The meeting started around 9:30 a.m. and was still in progress when I had to leave. It was scheduled to break up at 2:30 p.m. It is surprising the amount of spade work that must be done before any actual solicitation can begin. In the various meetings to date, we have had about 10 classmates in attendance, all from the east. But, a name seldom comes up which is not known by someone present. Ellis Littmann is now actually in the process of establishing his 40th Gift Committee, and I had hoped that I could publish news of it in this issue, but no permission yet, so no committee news. They are ready to go, however, when Ellis returns from a month in Spain and on the Mediterranean. I fear that Ellis can really take a month of ease and relaxation, as he is and always has been a hard worker, both for his own family and business, and, for the Institute. So the Committee next time, unless the boys find another medium for making it public.

We have a timely, and welcome notice from the M.I.T. Club of Mexico City, announcing the 22nd Fiesta, March 12-14, 1970. This Fiesta has become a very well established M.I.T. event in these 21 years, and now attracts Alumni and wives from all over. I'd like to see a few '33 men and wives use it this year as a vacation event, and ask that you please watch for Fiesta news in this issue, and, (I hope) in previous issues. I have every hope of making this one, as it is my fourth, at which time I am entitled to the "Eager Beaver" Award, at the Noche Mexicana, Saturday evening. However,

I may have to wait for this another year as I may be a part of a rather long winter cruise, which surrounds the Fiesta time. This Fiesta presents a splendid opportunity for the various classes to hold informal reunions, as actually does the Class of '21. Please consider this item, folks, and make it even if I can't. Aside from the Noche Mexicana, they have the annual luncheon at the University Club. A day's bus trip to San Juan del Rio, where they have the best wine cellars in Mexico, and, where luncheon will be served. James (Jim) Killian, '26, will speak in the evening, and, Saturday morning, they will hold another "Charreada", near the Olympic City. This event is sort of an amateur Rodeo; a very lively show of expert horsemanship by gentlemen jockeys (?), one of whom, last year, was an alumnus of M.I.T. There is practically no way for one to forget this event held in the new Charro Arena. For the first time, the Club is limiting the number of visitors to 100, so this is an added incentive, no?

It seems a good idea for me to mention that Thursday afternoon previous to the Class Officers' Conference, was devoted to a class secretaries' pow wow, in McCormick Hall. It was a great idea, and we had more than half of the class secretaries in attendance, plus wives, guests, a few of the Institute's great staff, and several "outside" speakers. Though all parts of the program were excellent, one class secretary really got the group excited. I refer to Carole A. Clarke, Secretary of the Class of 1921. Carole is recognized as Mr. Secretary by all and sundry, including your own scribe. Carole does a fine job every time and has been for years. He was, quite properly chosen to lecture on the work of secretaries in general. Well, he was tops, and caused more comments and questions than all other speakers combined, which was only natural as it was, after all, a secretaries' event.

Fellows and gals, please ponder the effort and just plain hard work that goes into a series of educational events; the planning, the organization, and finally, the expense to which the Institute goes to do a better job for all of us, through the Alumni Association. The series was,

this time, the Class Secretaries' meeting, the Alumni Officers' Conference, and finally the Alumni Seminar. On behalf of our entire Class, I wish to thank the M.I.T. Alumni Association for the fine job it did this time, and has done at all times. I have always maintained that when a man does a good job, tell him so. It costs little, and goes a long way.

With the annual shortage of class news in the offing, it occurs to me that we need a little stimulation and that stimulation must come from without, if I make myself plain. No matter, the status of grandfather has become sort of commonplace. Anyone who is a classmate and not a grandfather, is either not married or is not trying. However, one gets you ten that there are not many great-grandfathers, and I wish to start the ball rolling, and see if there are any, and if so, how many. I think that it might be a good idea to establish a few rules, and regulations, and submit that we ought to have a Charter Membership, with a limit of 25 Gr-Gr-Pops. So, starting right now, the first 25 entries will become such venerable members of this brand new Club. We have several men who have retired at the established retirement age, 65. As time goes on, there will, and must be more. By the time of our 40th, the charter membership ought to be full or well started. One condition: the prospective charter member must write me, or phone me, or wire me, personally, that he is submitting his name together with the name of the child, grandchild, and the great-grandchild, with approximate age attached, and other pertinent data. Could be that I won't make it myself, as my two grandsons are 17 and 18 years of age respectively, which makes me a longshot. So, let's go, and we will look into some sort of suitable award for Charter members.

I have all kinds of questions from Classmates on just what the heck is going on at the Institute with all these demonstrations, write-ups in newspapers, etc. One question from classmates seems to repeat itself in over half of the letters where the subject is mentioned: What percentage of the demonstrators are members of the M.I.T. community, that is—students, faculty, employees, etc.?

The answer is that there are many different estimates varying from 15 to about 30 percent. I do believe that our alumni group, total, is entitled to get the facts as they become available. As an alumni officer, I do get some information not generally available to the whole alumni group, and am willing to reply to any and all questions, just so long as the answer is included in reports sent to me.

Word just in says that your hard working president, **James E. (Jim) Turner**, has been appointed a group vice president by Textron, Inc. This was surely anticipated as the above story about Jim did not seem quite complete where he was placed in charge of a group, but with his title left hanging. Great stuff, Jim. We are all proud of you, and, don't forget you are more valuable to your company, in good health than you would be sick or worse. And to all of you chaps in big industry, take more vacations, live longer, and be far more valuable.

We have a few address changes, for your approval: Ralph E. Cross, M.E., Course II, Dr. Morris N. Green, G.E., Course IX, Brigadier General David L. Van Syckle, M.E., Course II, Cornelius J. Griffin, Jr., MG(XV), Robert C. Rogers, NA(XIII-C), Athelstan F. Spilhaus, AA(XVI), and not least by far, James E. Turner, MG(XV). These and all others dresses are available to anyone who asks and sends in his life and family history. No handouts without your story for the class History (new-notes).

We are saddened to hear, through the Alumni Office, of the passing of **John C. Gale**, of Bedford, Mass., on September 10. We have no further information on John's passing. If further word comes in, we will surely add it to our March notes. Mrs. Gale, our entire Class joins me in sending you our deepest sympathy in the time of your great loss and intimate friends of John's particularly so.

Fellas and gals, as time goes on, there will be more and more of these short obituaries and I do hope that you understand that it is no easy task communicating with survivors. However, the Alumni Association has recently taken a hand and has formulated a policy,

mentioned before, which assures the widow, or survivors, that they are not and will not be forgotten by either M.I.T. or by classmates. That's it, and please allow me to again ask for a few '33ers in Mexico City for the March Fiesta. Do drop in.—**Warren J. Henderson**, Secretary, Fort Rock Farm, Exeter, N.H. 03833 summer, 1079 Hillsboro Beach, Fla., 33062, winter.

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As you have already discovered from your mail, the committee for our 35th reunion has moved from the planning to the action stage. First came the mid-November mailing, with a registration form and return envelope, and then a call for dues. If you haven't already marked your calendar, now is the time to do it. The reunion will be at the Chatham Bars Inn, Chatham, Mass., June 12, 13 and 14, 1970. Judging by the success of our 20th and 30th reunions at the same spot, it should be a great event.

Following the weekend on Cape Cod will be Homecoming (Alumni Day) in Cambridge, starting Sunday evening at 5:00. There will be a cocktail party, dinner, and entertainment and, of course, the full schedule of activities on Monday. We hope each of you will be a promoter and recruiter for both the reunion and Alumni Day among the class members who live in your area.

As might be expected, the 9th Annual Golf Tournament turned up a photo finish. October 17th was a bright, sunny day in Santa Cruz, Calif. By noon the wind was coming in strong gusts as the two finalists teed off to determine the winner of the President's Cup for 1969. The top bracket finalist was **Ham Dow**, who already had two legs on the trophy (won in 1966 and 1967) and finalist in the bottom bracket was **Allan Mowatt**, who was in the finals for the first time. Allan had an added incentive: if he lost, Ham would permanently retire the cup and Allan, as Class President, would have to buy a new one. **Gerry Rich** acted as referee.

Allan won the first two holes in par, only to have sandtrap trouble on the next two,



L. Kanters, '36



G. Beesley, '39

and have Ham draw all even. Ham picked up two more holes and the first nine ended with Ham two up. The second nine was a seesaw affair with Allan picking up a net of one hole so that Ham stood one up on the 18th tee, a par 3. Allan won the hole with a bogey and the match ended on the 19th when Allan parred it again. So, the original cup donated by Leo Beckwith continues in circulation for at least another year and Allan is the 1969 winner.

Leo Beckwith and **Sid Grazi** were the other two semi-finalists in the main flight. Ham Dow's net 65 beat Leo's 70, and Allan Mowatt's net 63 beat Sid's 66. The consolation flight was won by **Bob Forster** over **Paul Daley**.

Ham and Edith Dow and Gerry and Verna Rich are all hopeful that they will see you all at the reunion. Allan saw **Les Brooks** along the way, too. . . . **Jeff Farmer** recently became affiliated with Butler Automatic, Inc., a Canton based company, as manager of manufacturing. —Co-Secretaries: **Phoenix N. Dangel**, 329 Park St., West Roxbury, Mass. 02132; **Irving S. Banquer**, 20 Gordon Rd., Waban, Mass. 02168

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The move by **Lawrence Kanters** to Gamble-Skogmo, Inc. as Vice President for Department Stores has previously been reported. Larry says of this move: "After 15 years in Pittsburgh . . . we have moved to Minneapolis . . . where we have found a whole new way of life in this big-sky country. Apart from the excitement of the new position all the Kanters (there are six of us plus two dogs) look forward to a continuing round of sailing and skiing—and life in the great outdoors." . . . **Francis Peterson** reports that on the first of last July he was transferred by Texaco from Richmond, Va., to Beacon, N.Y., where he started with the company. He is Supervisor of Employee Relations at the Beacon Research Laboratories. His older son, Kenneth, has returned from a year in Vietnam as an Air Force F-100 pilot and is now stationed on Long Island. Younger son, David, a Texaco National

Merit scholarship winner, is a freshman at Pennsylvania State University. . . . The notes above were sent in along with a contribution to the Alumni Fund as was a very modest note from **James Allen** reporting that his daughter Janet received her B.S. in Biology from M.I.T. in 1967 and that his son Robert is a freshman at Reed College. . . . Thank you, one and all!

On a recent trip to New Jersey I met Janet, **Russell Miller's** wife whom I had not seen, I believe, since our twentieth reunion. She reports that Russ continues with Atlantic Mutual Insurance and that they are living in Ridgewood. Their son Christopher was class poet when he graduated from Harvard in 1966 and their daughter Cynthia is at American International College in Springfield, Mass., after graduating from Westbrook Junior College in 1967. . . . The Chase Manhattan Bank, N.A. has announced the election of **William R. Hewlett** as a director of the bank and of the Chase Manhattan Corporation. Bill is currently president and chief executive officer of the Hewlett-Packard Company in Palo Alto. He is also a director of the Chrysler Corp., the FMC Corporation and the Overseas Development Council, and is a trustee of Stanford University and the Rand Corporation. . . . By the time you read this your secretary will have more or less settled in Cambridge for the winter months but she will be delighted to hear from you at either address.—**Alice Kimball**, P.O. Box 31, West Hartland, Conn. 06091, or 221 Lake View Ave., Cambridge, Mass. 02138

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Jerry Rodenhauer, Course II, has recently retired from MITRE, Bedford, Mass. He plans to settle in Florida.

Charles E. Reed, Course X, is Vice President and Group Executive, Components and Materials Group, at General Electric Co. **James D. McLean** has been elected President of Hurst Performance, Inc. Jim was formerly head of Hurst/Airheart Products, Inc. the company's West Coast subsidiary. Previously, he was consultant to the Secretary of Transportation, Washington, D.C. in 1967 and

Vice President of Shelby American, Inc. in Los Angeles during 1965 and 1966.

Fran Houghton's address is now RFD #5, Penacook, N.H., 03301. He has been divorced and remarried and is now working as sanitary engineer with the State of New Hampshire out of Concord, N.H., for the Water Supply and Pollution Control Commission. . . . **A. W. Chandler's** new address is 2202 E. 26th St., Tulsa, Okla. 74114. . . . Al Bank has moved to 1930 Winchester Road, Lyndhurst, Ohio 44124. **Norm Birch** and his wife Elvie have just completed a round-the-world trip.

Frank D. Lewis after many years with General Radio Co. has joined James Millen Manufacturing Co., Malden, Mass. With the cooperation of WSM, Nashville, Tenn., he has been conducting an interesting experiment which, he hopes, will lead to a new mode of dissemination of standard frequencies. His daughter Patty is a sophomore at Elmira College and his sons, Robert and Peter, are in Lexington High School.—**Robert H. Thorson**, Secretary, 506 Riverside Ave., Medford, Mass. 02155; Assistant Secretary, Professor **Curtiss Powell**, Room 5-325, M.I.T. Cambridge, Mass. 02142; **Jerome Salny**, Assistant Secretary, Egbert Hill, Morristown, N.J.

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Paul Black writes: "Just came across a useful book written by Vernon Lippitt, '38, *Statistical Sales Forecasting*. Vern is associated professor of Business Administration at University of Rochester and, according to the book jacket, 'a writer and speaker in the areas of business economics and forecasting.' " . . . **Jack Crichton**, in making his contribution to the Alumni Fund, says: "Am president and principal owner of a petroleum consulting and management firm—Crichton & Co. Spend much time in the Middle East and Alaska. Was the Republican Candidate for Governor of Texas in 1964. Anxious to know whereabouts of the SAE's of 1938."

Wilbur C. Rice reports: "ITT bought our parent company, Flygt AB Stockholm, Sweden. We were soon swamped with ITT paper work and forms, so before

we were buried in paper, I decided to buy out the ITT shares in Flomatic. So now it is sink or swim above (with the bank, of course)."

Chauncey F. Bell, Jr., writes: "Have just moved to Washington, D.C. from Santa Monica for a one to two year tour. We are establishing a Washington Defense Research Division, in addition to our former liaison activities here. Am Deputy Director, Logistics Studies Program for the Rand Corporation. Kay and I will enjoy seeing some of our old friends from Baltimore days (we left in 1956)."

Vincent Salmon writes that he is presently President Elect, Acoustical Society of America, 1969, and President of National Council of Acoustical Consultants, 1969.

Your secretary saw **Bob Johnson** a few weeks ago and he stated most emphatically that the question had been raised as to whether '38 should now try to have a reunion every year. If you have any strong feelings one way or the other on this, please write Class President Johnson at 11 Sterling Rd., Wellesley, Mass. 02181.—**A. L. Bruneau, Jr.**, Secretary, Hurdman and Cranstoun, Penney & Co., 140 Broadway, New York, N.Y. 10005

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Robert H. Thompson's wife, wrote that the reason she and husband Bob didn't attend the 30th reunion last June was that he was negotiating the purchase of a new venture: Bob is the new owner and president of the Oak Orchard Country Club, Inc., of Waterport, N.Y. After 30 years with Xerox, Bob made this move, and already has enjoyed a good summer. Thirtyniners are invited anytime to the OCCC for a game of golf or a dinner party. Location: between Rochester and Buffalo. Congratulations, Bob!

Will B. Jamison, has been appointed as President of Consolidation Coal Company's Lee Engineering Division, in Columbus, Ohio. Will was most recently with Walter Kidde and Company as manager of technical services-foam products, in Belleville, N.J.

Class President **George Beesley** wrote that he had had a letter from **Nicholas E. Carr**. Nick is now vice president and general manager of the First Chemical Corporation, in Pascagoula, Miss. He and his family got through the hurricane in reasonably good shape, but his plant took a real beating. Continuing, George talked with **Bob Casselman** about his work in modernizing the organizational structure of the Commonwealth of Massachusetts. George also recently saw **Bill Brewster** in good health but extremely busy in company affairs as Chairman of the Board of USM Corporation.

New manager of the physics laboratory at COMSAT Laboratories is **Edmund S. Rittner** who was formerly director of exploratory research at the North American Philips Corporation. . . . **Winthrop M. Leeds**, Course VI, wrote that he was recently appointed Consulting Engineer for the Power Circuit Breaker Division of the Westinghouse Electric Corporation.

And **Manning C. Morrill** noted that he visited **W. B. Parker** at his home in Wayland, Mass. Manny is President of Cryovac, and Brownie is with Dewey and Almy, both of the W. R. Grace corporate structure. At his headquarters in Duncan, S.C., Manny hosted **J. W. (Bill) Mohlman** currently with North American Rockwell, in Los Angeles.

Joseph A. Neuendorffer, is in Norfolk, Va., for a one year assignment doing research for the Navy. He will return to Alexandria next June. . . . Nelson T. Bogart, in his welcome note via his Alumni Fund contribution, noted that he had been named Corporate Vice President of Industrial Relations for Standard Oil of California.

J. Warren Evans wrote: "I am Chief Office Engineer for Kaiser Engineers, Division of Kaiser Industries. My duties take me periodically to Tel Aviv, Athens, and London. I enjoy working on the M.I.T. Educational Council. Have a three and one-half year old grandson; a son at Coe College in Iowa, a senior; a freshman son at Diablo Valley College, in Concord, Calif.; and a son in his junior year in high school."

Professor **Kenneth L. Cook** noted: "I am still Professor of Geophysics and Director

of the University of Utah Seismograph Stations. Last summer I spent seven weeks in Africa visiting the rift valleys with a group of twenty American professors as a participant of the International Geological Field Institute sponsored by the American Geological Institute. We visited Ethiopia, Uganda, Kenya, Tanzania, and Republic of South Africa."

In closing out this month's accounting of technical activities of various '39ers as received directly or as forwarded by the Review Office, let me append this highly technical report gleaned from the Associated Press on November 10, datelined Pasadena, Calif., with the headline "He Deals In Round Numbers." "Nobel Prize-winning physicist **Richard Feynman** says some figures relax the mind more than others. When he gets tired of math equations, he says, he studies the figures at the nearest bottomless bar. Feynman, 51, testified at a preliminary hearing for the owners and performers at Gianoni's, charged with permitting and giving lewd performances. 'When my calculations didn't work out, I would watch the girls,' Feynman told Judge John F. Hassler. 'It really doesn't help me with my mathematics, but it lets me come back to the equations fresh.' " How many serious classmates saw that news item and recognized the candor of our own Dick Feynman, Professor of Physics at Cal Tech?—**Oswald Stewart**, Secretary, 3395 Green Meadow Circle, Bethlehem, Pa. 18017

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Eleanor Norris notes that she is still teaching in elementary school in Hanson, Mass. . . . **John Joseph** writes: "President of Brrr Products Co., Inc. and inventor of BLOCKBUSTER corrugated cardboard toy construction blocks and building boards still being sold nationally after 18 years. Active in new democratic politics. Ran for Congress in 1968 as peace candidate. Twice a grandfather by son, Ben, a lawyer in Philadelphia."

Fredyum Henrickson also writes this month: "Have been with Allied Chem in Syracuse since graduation with 4 years out with Corps of Engineers W.W. II;

3 girls, 1 boy, 2 oldest in college. Member A.I.Ch.E. Crystalizer Sub-committee. Return to Massachusetts every summer at Wellfleet, Cape Cod."

From **T. Stewart Harris** comes the information: "I have gone into business for myself as a consulting engineer specializing in product design and production. I had a delightful visit with John Vanderpoel, '40, who stopped in on a business trip shortly after retiring from the army. John is an avid cyclist."

Bob Levis, 2nd, who is a director of Owens Illinois and Chairman of the Board of the First National Bank and Trust Co. of Alton, Ill., was presented a Distinguished Service Award by Southern Illinois University during commencement exercises August 29. The citation: "Robert H. Levis II, banker, rancher, archeologist, but above all, man of compassion who devotes a large part of his resources to the betterment of the community. He has contributed generously of time and money to help the small businessman, to stimulate a dialogue between the Black and White communities, and for urban renewal in downtown Alton."

"By his archeological research he has added to our knowledge of the peoples who lived in Southern Illinois before the arrival of the White or Black man. His interest in higher education was shown in his efforts to bring Southern Illinois University to this area and his activity in raising funds for the purchase of our campus. He is a modest man who is willing to give others the credit as long as the job gets done."

Clare L. Milton, Jr. is now Vice President of Development Engineering of Eastern Products Corp. . . . No further details are available yet on the reunion in June. As always, your Secretary looks forward to letters from classmates. [See letter to the editor from Mr. Gutttag on page 87 of this issue—Ed.] Views of classmates are welcomed and will be published in this column.—**Alvin Gutttag**, Secretary, Cushman, Darby & Cushman, American Security Building, 730-15th St., Washington, D.C. 20005

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Michael J. Driscoll was in the news when he opened an office for the practice of law at 23 Broad St., Nantucket, Mass. Because of the historic nature of that area, Mike had to obtain a special sign permit from the Historic District Commission as to style, color, wording, size and placement of his professional "shingle" which also carries the names of two other attorneys with whom he is associated at the same address. Besides his B.S. from M.I.T., Mike has earned an L.L.B. from Northeastern School of Law and was admitted to the bar after his graduation from the latter school.

Rogers B. Finch has been named Director of Planning, reporting to the

president of Rensselaer Polytechnic Institute. His new responsibilities since his appointment last September include all academic, physical and long range planning. . . . **Louise Houssiere Herrington** is presently teaching Earth Science and General Science in a high school which is local to her home in Jennings, Louisiana. She has a 14 year old daughter attending the same school and a son who is a pre-med freshman at Tulane University. Her daughter is a nationally ranked tennis player.

John H. Brannan has been appointed Manager, New Business Ventures, for Union Carbide Corporation's Carbon Products Division. He joined Union Carbide in 1946 as an industrial sales engineer, with subsequent assignments in Cleveland, Chicago, Indianapolis and Birmingham. In 1960 he became associated with the applications technology group of the Carbon Products Division's Advanced Materials Laboratory, and was named manager in 1961. He was made manager of Government contracts in the Technology Department in 1964, and in September, 1965 was named marketing manager of the Advanced Materials Department of the Carbon Products Division. He has served as new products manager since July, 1968.

Charles A. Wales has been named Plant Manager of the Marietta Plant of Union Carbide Chemicals and Plastics Division. . . . **James W. Neighbours** reports: "After spending 21 years as a commissioned officer in the U.S. Navy, I retired in December, 1961 and became President of Agawam Aircraft Products Corporation, located at Sag Harbor, New York. I sold this operation to Grumman Aerospace Corp. in December, 1964 and have continued as Manager of that plant. We manufacture hydraulic and electro-mechanical assemblies for aircraft and for the Grumman Lunar Module."

George S. Burr has been elected to the board of directors of Norfolk County Trust Company in Canton, Mass. George is also Chairman of the Board of Instron Corporation, 2500 Washington St., Canton. He and Harold Hindman, '39, Instron's president, who were associates at M.I.T., established the Instron Corporation in 1946. The company manufactures testing instruments that are used to measure the strength of materials. While the principal manufacturing facility is in Canton, manufacturing also is carried on in England and the company maintains sales offices throughout the U.S. and operating subsidiaries in France, England, Japan, Switzerland and Canada. George resides at 166 Edmunds Rd., Wellesley, with his wife and five children.

John C. Sluder is a member of the sponsoring committee for the Underwood-Prescott Professorship, funding for which has been provided partly by a substantial pledge from the Wm. Underwood Co. John is Vice President of the Nestle Co., Inc., White Plains, N.Y. . . . **William R. Mason** is a member of the Committee on Social and Behavioral

Urban Research which is one of two committees of the National Research Council issuing a report last September stating that: "The problems of the cities . . . will not succumb rapidly, whether to technological innovations, to new administrative arrangements, or to new social programs." The report recommended extensive long range research programs to obtain needed information for a better understanding of the many interrelated aspects of urban units.

William E. Lamar is the author of a lengthy article entitled "Military Aircraft: Technology for the Next Generation" appearing in the September, 1969 issue of *Astronautics and Aeronautics*. It is a weighty discussion of emerging technologies needing systematic research and development to push them through the "confidence" and cost barriers. Bill has been Deputy Director of AFSC Air Force Flight Dynamics Laboratory since 1964, and has long led Air Force flight research, experimental-aircraft project engineering, advanced system analysis and planning, systems management, and systems engineering. As chief of new developments for bombardment aircraft, he was closely associated with the initial development of the XB-52, B-58, B-57D, and KB50J.—**Walter J. Kreske**, Secretary, 53 State St., Boston, Mass. 02109; **Everett R. Ackerson**, Assistant Secretary, 831 Cranford Ave., Westfield, N.J. 07090; **Michael Driscoll**, Assistant Secretary, 23 Broad St., Nantucket, Mass. 02554

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Ed Vetter was named President of Texas Instruments, Subsidiary Geophysical Service, Inc., in Dallas. . . . **William G. Andrew, Jr.** has been elected vice-president-engineering of Fenwal Industries. With Fenwal since 1949, he has been chief engineer since 1964.

Henry Hill, President of Riverside Research Laboratories in Watertown, Mass. has been appointed to the National Commission on Product Safety. The commission has been established to advise the Senate Subcommittee for Consumers in matters of product safety.

Articles in *New England Electrical News* and in the *Boston Herald Traveler* inform us about **Jack Cantlin** and Smithcraft Corporation's move from Chelsea to Wilmington, Mass. Jack has been President of the Smithcraft firm since 1965 and he says that sales volume should be in the \$15,000,000 range within the next 2½ years. The new plant is on 12 acres of a 20 acre area and ultimately will be 400,000 square feet. . . . **Ed Telling** represented the Institute at the inauguration of Richard C. Jones as President of the State University of New York College at Cortland. . . . **R. J. Hammerstrom** was co-editor of the "Proceedings of the Gulf and South Atlantic States Shellfish Sanitation Research Conference" published by the Department of H.E.W. . . . **Lawrence Ailer** of U.C.L.A. authored an article in the September, 1969, issue of

Thanksgiving, class telethon, Christmas, New Year's, 25th reunion, graduation! You name it, for I am confused! Unfortunately, Review deadlines, 25-Year Reunion plans, etc., are such that it is difficult to give you a proper picture of either where we have been or, for that matter, where we are going. I do know that your attendance is required if this 25th reunion is to be a success. By next month we should have a handle on this situation.

On October 30 Bill Meade advised that the following families will be at the reunion: Charlie Buik, Dwight Collmus, Prexy Tom Hewson, Jim Hoaglund, Nick Mumford, Jim Pickel, Max Ruehrmund, Ed Stoltz, Dave Trageser and Bob Wilson. Bill went on to say that he felt the several Committee members might attend as well! In a phone conversation last evening, Tom McNamara advised that the meeting on November 4 brought forth some concrete plans!

Bob Maglathlin, our 25-Year Book Chairman, advises that your resume (don't forget that picture!) must be in his hands immediately if you expect to see your name in print. On second thought, pos-

sibly the Chairman and your Class Secretary should fabricate your resume!

On the personal front, I had a wonderful luncheon here in New York with **George Bickford** on November 7, some ten days ago. "Curly" is back at Carrier in Syracuse playing (that's my word, not his) with computers. His family has had its ups and downs as have we all; fortunately, things are looking up at the moment. George is particularly proud of Susan who was given advanced placement at Kirkland at the end of her Junior year in high school.

Max Ruehrmund, Class Reunion Gift Chairman, and I look forward to our New York telethon two weeks hence.

In mid July, 1969, **George M. Berman** was elected President and Chief Executive Officer of Unitrode Corp., a Watertown, Mass. maker of electronic products. . . . **Dr. R. Tully Bradford** is an ophthalmic surgeon in Cincinnati. . . **Richard H. Baltin** who has been in charge of the development of the programming of Apollo computers spent two weeks in Russia in the fall as a guest of the

Soviet Academy of Sciences. . . **Dave Clare**, Executive Vice President & General Manager, Hospital & Professional Division, Johnson & Johnson was named a director of the American Management Association annual meeting last September. At this same meeting Dave received a Distinguished Service Award as a past Vice President on one of A.M.A.'s Planning Councils.

William A. Loeb is serving as Co-Chairman of the Public Affairs Committee, M.I.T. Alumni Center of New York. . . . **Don J. Lovell** is Professor of Optics at the Massachusetts College of Optometry after a year of research at the University of Massachusetts. . . . **Spence Standish** was named President of Albany Felt Co. last July. . . . **Tom Markey** recently joined Edlong Chemical Company, a manufacturer of specialty flavorings located in Elk Grove, Ill. as Vice President—Sales and Marketing. . . . **Don Kuehl**, Chief of Process Engineering—Composite Materials, at Hamilton Standard, was just elected to the Council in Manchester, Conn.—**C. H. Springer**, Secretary, MFB Mutual Insurance Co., 420 Lexington Ave., New York 10017

Sky and Telescope on spectrographic observations of planetary nebulae.

Al Hayes reports from San Jose, Calif.: "still plugging along in my private practice as a consulting engineer, not making much money, but finding out that this is the dream I was looking for when I entered Tech those many years ago." . . . **Robert Breckenridge**, Course V, had a wonderful tour of the Far East visiting Bangkok, Singapore, Kuala Lumpur, Hong Kong, Taipei and many places in Japan. . . . **Bob Cunningham** writes: "As a freshman at M.I.T., when not wandering around in a fog, I meddled with a side project in fog research. Now I still find myself with my head in the clouds of New Mexico and fog clearing schemes in West Virginia."

From Green Bay, Wis., **Fred Sargent, 2nd**, brings us up to date: "Since January 1968 I have been Professor of Human Ecology and Dean of the College of Environmental Sciences at the University of Wisconsin. Also member of National Air Quality Criteria Advisory Committee to the National Air Pollution Control Administration." That wins all the marbles for the longest title reported by any classmate this year! . . . **Pete Sloss**, still living in Highland Park, Ill. sent the shortest report for this issue: "Sales Manager, Macoid Corp.—4 children—Busy." . . . **Bill Fortune** in Los Angeles writes that he is active in technology transfer from aerospace to industry and education. Sounds interesting, Bill. How

about some more information for future class notes? . . . Two of **Ed Thode's** offspring are at college: Stephen, a Freshman at Coe College and Karen, a Senior at the University of Maine. Younger son, Jonathan, is still at home and Ed reports that he is the future Technologist. Admissions Office, take note!

On October 1, **George Toumanoff** was appointed Director of the Transportation Systems Division of Cutler-Hammer. His division works with the F.A.A., Army, Navy, and Air Force on air traffic control and on instrument landing systems. . . . **John Whitman** has left the Army SAFE-GUARD ABM System Office where he had worked for the last two and a half years. He has returned to Raytheon and is living in West Concord.—**Ken Rosett**, Class Secretary, 191 Albemarle Rd., White Plains, N.Y. 10605

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This month we have several notices from news sources. **Henry N. Bowes** has been appointed Director of the General Electronics Branch of the Lockheed Electronics Company's Houston Aerospace Systems Division. Henry was an electronics officer on a destroyer during the war and held responsible engineering and supervisory positions with Stromberg-Carlson and General Dynamics before joining Lockheed Electronics in 1963. Starting in the New Jersey plant, he moved to Houston in 1965 to work on

guidance and control problems (presumably for Apollo). Henry is an active member and past chairman of the Training Advisory Committee of the National Security Industrial Association and a senior member of the IEEE. He married Margaret McKenney from his home town of Bristol, Conn.

Just a brief note from **John Cornell**—he has been made Vice President and Director of Research of Sartomer Resins, Inc., Essington, Pa. In the *IEEE Transactions on Power Apparatus* for May 1969, there is an article by **Andrew F. Corry**, Course VI. It is titled "Measurement of Individual Conductor Tension During Pipe-Type Cable Installation." Next to a handsome picture was a sketch of his background. After getting his degree in 1947, Andy joined the Boston Edison Co. where his major fields were overhead and underground transmission and distribution design, testing, and standardizing activities and research. He is Chairman of the Insulated Conductors Committee and Vice-Chairman of the Electric Research Council Steering Committee on Underground Transmission. (That IEEE professional society has a marvellous organization—I think.)

The National Research Council has announced that **Robert H. Dietz**, Course IV, was on the Committee on Urban Technology. His group prepared NRC Publication 1729, "Long-Range Planning for Urban Research and Development: Technological Considerations," dated Septem-

ber 1969. This work was done at the request of the Department of Housing and Urban Development and included recommendations such as "—considerable technology exists that could improve mass-produced low-cost housing, develop more adequate and sophisticated systems for transportation, utilities, and services, and help the cities utilize land more efficiently—doubling the level of R and D activities for the next three years." However, I believe one of his associate committees had the right idea: "A primary need is to develop research policies and programs that will provide a better understanding of the social processes involved in fulfilling the social and behavioral requirements of the persons affected."

The Boston *Herald Traveler* carried news of the M.I.T. crew and **Jack Frailey**, the coach of the 150-pound squad. Unfortunately, an item in the October 27, 1969 edition stated that Harvard won the Senior Eights, Senior Fours, and Lightweight Eights. Better luck next time, Jack. . . . **Jack Sonnenblick**, Course XVII, was elected a director of the Granite Equipment Leasing Corp. of Garden City, N.Y. Jack is president of his own company, Sonnenblick-Goldman Corp. . . . We have notice of another article, this time in the *Naval Engineers Journal* for August 1969. It is by **Edwin Pyle** and is titled "Second Generation Gas Turbine." Ed describes an approach to providing a greatly improved marine gas turbine with respect to fuel economy, reliability and maintainability. After a two-year tour with the Navy Bureau of Aeronautics, Ed joined G.E. as a jet engine design engineer. During the last 22 years he has been associated with the J35, J47, X211, J79, LM 1500, and LM 2500 designs mainly in the hot section of the engine. His present title is Senior Turbomachinery Engineer for the LM 2500 at the G.E. plant in Evendale, Ohio.

I was pleased to note that a Middlebury College M.I.T. colleague of mine has been named manager of marketing for the Stone and Webster Process Industries Group. **Richard J. McGarry**, a vice president (1963), will direct and co-ordinate all new business development, proposal and contract functions. . . . From the *LaPorte Herald-Argus* for August 12, we learn that **C. William Ritterhoff** has been appointed to the Board of Directors of the Citizens Bank of Michigan City. Those of you who are trying to borrow money in the tight market may want to contact Bill. On the side he is General Manager of the Burns Harbor plant of Bethlehem Steel, having joined the company in 1948 as an assistant engineer in the mechanical department of the Sparrows Point, Md. plant.

Here are two recent address changes: **W. E. Ritchie**, Apt. 21, Lake Shore Park, Watervliet, N.Y. 12189; **William Tierney**, 7 Lorrigan Rd., Hopkinton, Mass. 01748. Send your news to—**John G. Barmby**, Class Secretary, IITRI, 1825 K St., NW, Washington, D.C. 20006

46

I attended the Cleveland Regional M.I.T. Alumni Conference on October 18 and had hoped to see several from the Class of 1946. Regrettably only **Hugo Johnson**, his wife and I attended from the Class of 1946. Even more ironic was that I was unable to locate Hugo in the perhaps three hundred people that attended. I wish now that I had been foresighted enough to bring along a copy of the 1946 *Technique* and then after referring to the list of those attending I could have looked up Hugo's picture and found him in the group.

Sam Meerbaum is now on education leave at U.C.L.A., and is working for his Ph.D. in bio-engineering with his thesis work at a local hospital. Sam's wife, Nora, is a Regents Scholar at U.C.L.A.; a daughter, Monica, is on Vista assignment in Arkansas, after graduation from Pomona College; Lynn (18) is at U.C.L.A., and Julie (12) is attending junior high.

Cliff Woods writes from Greenwich, Conn. that he is in the banking business but does not advise which bank. His work at the bank is in mergers and acquisition, and private placements. Cliff and his wife, Mary Lou, have four children, all now of school age.

Norton I. Satz has been appointed to the newly created position of Vice President, Industrial Accounts Group, of the Meldrum and Fewsmith, Inc. advertising firm of Cleveland, Ohio. Norton will be responsible for service to all Meldrum and Fewsmith commercial, industrial capital equipment and hard good accounts. He joined Meldrum and Fewsmith, Inc. in 1960 after service with General Motors and became a Vice President of the agency in 1967.

Charles J. Fisher has been named president and general manager of Reliance Panelyte of Tupelo, Mississippi. Panelyte is the plastic laminate division of Reliance Universal, Inc. of Louisville, Ky. Charles was formerly vice president and division manager of the Wyomissing Corp. of Reading, Pa.

Reverend **John A. Russell, Jr.**, is the viceprovost for student affairs at the University of Pennsylvania. An ordained Methodist minister, he was Methodist chaplain at Yale and M.I.T. before his position at the University. Recently Reverend Russell was named to a newly formed visiting committee of business and education leaders for Drew University of Madison, N.J. The committee is to serve as sounding board for improving teaching, research, and administrative practices at the University.

David G. Hoag was awarded the Public Services Award of the National Aeronautics and Space Administration for development of the guidance systems for the Apollo moonships. Dave is an associate director of the Instrumentation Laboratory of M.I.T., and director of the Apollo

Group and has been in overall charge of the laboratory design and development of the guidance systems for both the Apollo command module and lunar module. What can you say or add to any accolades for these great and inspiring accomplishments? . . . Until next time.—**Russ Dostal**, Secretary, 18837 Palm Circle, Cleveland, Ohio 44126

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In mid-October Gina and I attended the Cleveland Regional M.I.T. Alumni Conference and had a most enjoyable day. There were talks by Professor Morrison on "The New Cosmos," Nevin Scrinshaw on "New Food Sources," Professor Collins, ex-mayor of Boston, on "Progress in Urban Affairs," Joseph Licklider on "Family Use of Computer Services" and President Johnson on "M.I.T. Looks Ahead."

There also was ample opportunity at lunch and cocktails to chat with the representatives of the Institute and schoolmates. From our class there was only **Alexander Ward** who was accompanied by his wife but Ken Brock and Bob Collins, both of whom started with us, were there. Ken, '48, is, as you know, with the Alumni Office in Cambridge so was present in an official capacity. Bob Collins, '49, is with Goodrich Chemical here and turns out to be a neighbor of ours. He was accompanied by his wife, Katie, who is our classmate Ed Meissner's sister. Also present was Russ Dostal, secretary of the class of '46, whom I hadn't seen since he left school, so it was interesting chatting with him and comparing our common dearth of communications from you.

The mail brings notice that on the same date as the Regional meeting, **Parker Symmes** was married to Mary Alice Reid Wessel. Congratulations Parker and our best to you both. . . . **Art Ashbrook**, Course XIV, who obtained his doctorate with us writes that he, one of the last of the Keynesian Economists now hangs out his shingle at the National War College in Washington, D.C. . . . **Jack B. Lehmann** drops a note advising that he is area manager for a subsidiary of American Hospital Supply Corporation. He moved to the Chicago area two years ago with his wife and four children and all love their present location. . . . **W. L., Fryberger** is now Professor of Metallurgical Engineering at Michigan Tech. . . . **T. Hechler**, Course XVI, is a member of the Apollo program Office of Manned Space in Washington, D.C. He has been there since mid 1965. . . . The government printing agency notes that **C. F. Jenkins** has co-authored an essay on the "Cost Effectiveness Sensitivity of National Data Buoy Systems," and our prolific writer **Henry Lee** has written "Development of Implant Conduits—Safety Connector for Hemodialysis Cannulae."

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ber 1969. This work was done at the request of the Department of Housing and Urban Development and included recommendations such as "—considerable technology exists that could improve mass-produced low-cost housing, develop more adequate and sophisticated systems for transportation, utilities, and services, and help the cities utilize land more efficiently—doubling the level of R and D activities for the next three years." However, I believe one of his associate committees had the right idea: "A primary need is to develop research policies and programs that will provide a better understanding of the social processes involved in fulfilling the social and behavioral requirements of the persons affected."

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Sam Meerbaum is now on education leave at U.C.L.A. and is working for his Ph.D. in bio-engineering with his thesis work at a local hospital. Sam's wife, Nora, is a Regents Scholar at U.C.L.A.; a daughter, Monica, is on Vista assignment in Arkansas, after graduation from Pomona College; Lynn (18) is at U.C.L.A., and Julie (12) is attending junior high.

Cliff Woods writes from Greenwich, Conn. that he is in the banking business but does not advise which bank. His work at the bank is in mergers and acquisition, and private placements. Cliff and his wife, Mary Lou, have four children, all now of school age.

Norton I. Satz has been appointed to the newly created position of Vice President, Industrial Accounts Group, of the Meldrum and Fewsmith, Inc. advertising firm of Cleveland, Ohio. Norton will be responsible for service to all Meldrum and Fewsmith commercial, industrial capital equipment and hard good accounts. He joined Meldrum and Fewsmith, Inc. in 1960 after service with General Motors and became a Vice President of the agency in 1967.

Charles J. Fisher has been named president and general manager of Reliance Panelyte of Tupelo, Mississippi. Panelyte is the plastic laminate division of Reliance Universal, Inc. of Louisville, Ky. Charles was formerly vice president and division manager of the Wyomissing Corp. of Reading, Pa.

Reverend **John A. Russell, Jr.**, is the viceprovost for student affairs at the University of Pennsylvania. An ordained Methodist minister, he was Methodist chaplain at Yale and M.I.T. before his position at the University. Recently Reverend Russell was named to a newly formed visiting committee of business and education leaders for Drew University of Madison, N.J. The committee is to serve as sounding board for improving teaching, research, and administrative practices at the University.

David G. Hoag was awarded the Public Services Award of the National Aeronautics and Space Administration for development of the guidance systems for the Apollo moonships. Dave is an associate director of the Instrumentation Laboratory of M.I.T., and director of the Apollo

Group and has been in overall charge of the laboratory design and development of the guidance systems for both the Apollo command module and lunar module. What can you say or add to any accolades for these great and inspiring accomplishments? . . . Until next time.—**Russ Dostal**, Secretary, 18837 Palm Circle, Cleveland, Ohio 44126

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In mid-October Gina and I attended the Cleveland Regional M.I.T. Alumni Conference and had a most enjoyable day. There were talks by Professor Morrison on "The New Cosmos," Nevin Scrinshaw on "New Food Sources," Professor Collins, ex-mayor of Boston, on "Progress in Urban Affairs," Joseph Licklider on "Family Use of Computer Services" and President Johnson on "M.I.T. Looks Ahead."

There also was ample opportunity at lunch and cocktails to chat with the representatives of the Institute and schoolmates. From our class there was only **Alexander Ward** who was accompanied by his wife but Ken Brock and Bob Collins, both of whom started with us, were there. Ken, '48, is, as you know, with the Alumni Office in Cambridge so was present in an official capacity. Bob Collins, '49, is with Goodrich Chemical here and turns out to be a neighbor of ours. He was accompanied by his wife, Katie, who is our classmate Ed Meissner's sister. Also present was Russ Dostal, secretary of the class of '46, whom I hadn't seen since he left school, so it was interesting chatting with him and comparing our common dearth of communications from you.

The mail brings notice that on the same date as the Regional meeting, **Parker Symmes** was married to Mary Alice Reid Wessel. Congratulations Parker and our best to you both. . . . **Art Ashbrook**, Course XIV, who obtained his doctorate with us writes that he, one of the last of the Keynesian Economists now hangs out his shingle at the National War College in Washington, D.C. . . . **Jack B. Lehmann** drops a note advising that he is area manager for a subsidiary of American Hospital Supply Corporation. He moved to the Chicago area two years ago with his wife and four children and all love their present location. . . . **W. L. Fryberger** is now Professor of Metallurgical Engineering at Michigan Tech. . . . **T. Hechler**, Course XVI, is a member of the Apollo program Office of Manned Space in Washington, D.C. He has been there since mid 1965. . . . The government printing agency notes that **C. F. Jenkins** has co-authored an essay on the "Cost Effectiveness Sensitivity of National Data Buoy Systems," and our prolific writer **Henry Lee** has written "Development of Implant Conduits—Safety Connector for Hemodialysis Cannulae."

John Kellett has recently returned from living in London to become project

accurate Costing Eroding Your Profits?" in *Business Management*. (How to go about selecting the optimum cost system for a specific situation.)

Notes from the Alumni Fund envelopes include one from **Davis Wilson**, who now has over 11 years with Lockheed as an Engineering Supervisor on the Polaris-Poseidon Flight Test Program at Cape Kennedy, as well as three kids and a well-used travel trailer. . . . **Milt Bevington** reports a new son, Paul Christian, born August 18, 1969, bringing the total to five boys and one girl. . . . **George McQueen** used the notes section on his Alumni Fund envelope to request acknowledgement that Polaroid matched his gift last year, but otherwise included no notes for the Secretary. No news is good news, George? . . . Finally, a mailing announcing the 22nd Annual M.I.T. Fiesta in Mexico City was addressed to our previous Secretary as Mr. Letcher Eaton. Say it isn't true, Fletch.—**Frank T. Hulswit**, Secretary, 77 Temple Rd., Concord, Mass. 01742

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It is with regret that we must report the death of one of our classmates, **Charles A. Govatsos**, XV, who passed away last November. He was a resident of Wellesley, Mass. and was vice president of Bestbach, Inc.

Ed Kruse, Course X, reports that he has participated in both the October 15 moratorium and the Nov. 14-15 march on Washington. Ed reports great interest in this movement and hopes to hear from other classmates. . . . **David E. Webster**, XV, reports that he was elected Chief Executive Officer of a group of South-eastern Steel & Wire companies. . . . **Robert L. Titus**, VI, has been promoted to the new post of General Products Manager of Murray Manufacturing Corp., a division of Arrow-Hart.

Bill Millen, X, is now a partner in the law firm of Millen, Raptes and White, in Arlington, Va., specializing in patent law. . . . **Thomas Cerwonka** has joined I.B.M. system manufacturing at the Kingston, N.Y. plant. . . . **David M. Uline** joined the firm of Sargent & Greenleaf, Inc., in September of 1968. . . . **Robert C. Michel** is currently serving as President of the River Edge Board of Education.

Myles S. Spector has been appointed by Governor Richard Hughes to a 5-year term as Commissioner of the Hackensack Meadowlands Development Commission—charged with overall development and planning for the 18,000-acre meadowlands district. . . . **Royden Stanley Bair** reports that he organized "College Night" at the local high school last year and conducted their second annual program this year. He represented M.I.T. and had 34 other schools included. Also, he opened his own office for the practice of architecture in April, 1969. . . . **Paul A. F. Mourier-Petersen** is still living in

Sao Paulo, Brazil, as Director of South American operations for Dorr-Oliver, Inc.

Joseph D. D'annunzio is President of the National Utility Contractors Assoc., as well as a member of Construction Committee, Technical & Professional Council, American Water Works Association. . . . **Allan W. Shaw** is still Chief of Aerodynamics at Vought Aeronautics Division of LTV Aerospace in Dallas, Texas. . . . **Gerald L. Robinson** is President of Operations Research Club of Central Ohio for 1969-1970. He presented a paper, "Simulation Models for Evaluation of Airport Baggage-Handling Systems" at the third conference on Applications of Simulation, December 8 to 10, 1969, in Los Angeles.

David S. Hacker is now Associate Professor of Chemical Engineering at the University of Illinois's Chicago Circle Campus Activities. They are developing programs in science education for elementary school teachers and high school programs. . . . The latest addition to (Professor-Researcher-Consultant) **John H. Schmertmann's** life is Joy Anne. He also has three boys. . . . **David J. Rose** reports that after 11 years as Professor of Nuclear Engineering at M.I.T. he has joined A.M. Weinberg's staff at the Oak Ridge National Laboratory, working on long-range planning and laboratory goals.

Martin S. Osman has recently joined the Polaroid Corp. as a senior electronic engineer. . . . **D. A. Harnsberger** moved to London, in 1964, as managing director of Cooper-Bessemer (U.K.) Ltd.; he then moved to Dusseldorf in 1967 to start a new German joint-venture company "Cooper-Vulkan Kompressoren GMBH." Their main activity has been the supply of 15,000 h.p. jet turbine driven compressor units for the European Natural Gas Transmission network. . . . **Gerry Lessells** joined the J. M. Huber Corporation's Ink Division in May of 1969 as lab manager and has just been promoted to Technical Director. Very active in career guidance for disadvantaged youth, he is heading the Institute's national effort in this area. Gerry is also Chairman-elect of the local New Jersey section. His other activities include the Educational Council, being treasurer for a ghetto self-help "storefront" and keeping himself and his wife sane while raising three preposterous teen-age boys.

Donald P. Germeraad, Manager, Ocean Systems Program Development, directs activities of advanced systems, project development, advanced ocean technology, and the ocean mining and hydrodynamics departments. Currently affiliated with the Naval Air Reserve Staff at NAS, Alameda, Calif., his present rank is Captain. . . . **Robert A. Snedeker** has been appointed to the Educational Council of M.I.T. . . . **Lawrence Gould** has been elected president of Microwave Associates, Inc. . . . **Frank W. Conlin, Jr.**, saw Doug Haven, '52, on Cape Cod while vacationing last summer. They had a great time reminiscing

over old times at Tech. Frank took his family skiing this past spring at Mad River Glen, Vt. He has three girls, 11, 9 and 6, and a son, age 4.

John F. McCarthy, Jr., is Executive Vice President, Los Angeles Division, North American Rockwell Corp. Elected a Fellow of the A.I.A.A. in October 1969, he received a Ph.D. from the California Institute of Technology in aeronautics and physics in June 1962. . . . After an industrial engineering career in a number of large commercial, publication and business forms companies, **Raymond N. Blair** moved into the writing/editing end of printing industry technology in 1963. Founder and first Director of the American Institute of Industrial Engineers' Printing, Publishing, and Paper Division, he has recently become Editor of *Graphic Communications Weekly*. . . . **R. A. Horne** has just completed one year studying sculpture at the San Francisco Art Institute. His first book (R. A. Horne, *Marine Chemistry*, Wiley-Interscience, 1969) has been published. He has a new job at the Woods Hole Oceanographic Institution. . . . **Jonas Medney** formed the Fiberglass Resources Corp., Motor Ave., Farmingdale, N.Y., in October of 1968 and is President of the firm which manufactures fiberglass piping systems. He has a wife, Muriel and 3 boys, Michael—16, Brad—9, and Neil—6. . . . Don't forget our 20th reunion—Harborside Inn—Martha's Vineyard in June.—**John T. McKenna, Jr.**, Secretary, 2 Francis Kelly Rd., Bedford, Mass. 01730

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We have been de-emphasizing news concerning classmates who have only received graduate degrees with our Class, but we report the following with a combined sense of pride and duty. Our Class has, by a slight stretch of the imagination and a great deal of presumption, arrived. Professor **Murray Gell-Mann**, Ph.D. VIII, received the 1969 Nobel Prize in Physics. The citation read for his "contributions and discoveries concerning the classification of elementary particles and their interactions." I think that anything else would be anticlimactic, nevertheless a summation is in order at this time. Professor Gell-Mann is at Cal Tech and his name has appeared so many times in these notes over the past few years because of his numerous awards and honors, that we had been holding a collection of clippings to supplement a future column. It is only fitting that we release them at this time. Murray was appointed to President Nixon's Science Advisory Panel; he was the subject of a feature article on "The Shimmery New Image of Matter" ("The World of the Very Small") in *Fortune* magazine, June, 1968, (discussing such particles as Leptons, Muons, Baryons, and so on—no pun intended) which referred to Professor Gell-Mann as one of the great influences in high energy physics both in the U.S. and abroad; he spent a year at Princeton's Institute

for Advanced Studies; Murray received the John J. Carty medal for distinguished accomplishments in any field of science; he became the first Robert A. Millikan Professor at Cal Tech and a member of one of the Institute for Defense Analysis's (IDA) steering committees; and well, how else should it culminate but in a Nobel Prize. Congratulations Murray, we're proud merely to have been at M.I.T. at the same time as you!

George Brown delivered a paper, "An Integrated Experimental Engineering Curriculum," at the Laboratory Oriented Studies for Engineering Students conference. He described his work on a new project laboratory approach for mechanical engineering laboratory education being introduced at the University of Rhode Island. . . . At the time of his retirement from the Air Force after nearly 30 years service, Colonel **James Cobb** was presented with the Legion of Merit for his contribution to the space research and development program. He was assistant vice commander of the Air Force Systems Command's Space and Missile Systems Organization at Los Angeles.

Eliahou Dabora has joined the University of Connecticut's Aerospace Engineering Department. He was previously with the University of Michigan, Gas Dynamics Laboratory. . . . Lieutenant Colonel **Francis Davis** is now in Germany as Commander of Signal Battalion 447. . . . One business in New York was not enough to keep **Stephen Eisen** busy, so he went to Chicago and started two more: EMCON Assembly and Distribution Co. Inc., and J & J Truck Leasing Corp. He reports both are doing nicely. . . . Dr. **Allan Faller** is now Research Professor at the University of Maryland Institute for Fluid Dynamics and Applied Mathematics.

Maurice Hedaya writes from New York that he has been elected president of a family business, Holiday Fair, Inc. and asks all to "watch us grow." We're still waiting for Rat Fink Samples, Maurice. . . . **William Holden**, his wife, Nancy, and Todd, 5, are now in Fairfax, Va. He is with MITRE-Westgate. . . . **Henry Jex** is working on man-machine system optimization for Systems Technology, Inc., Hawthorne, Calif. He was the co-author with Warren Clement, '50, of an article in the *I.E.E.E. Transactions*, "A Manual Control-Display Theory Applied to Instrument Landings of a Jet Transport." . . . **Russell W. Osborn, Jr.** was president of Jarrell-Ash S.A. in Europe. After two and a half years in Switzerland, wife Rita, Brian, 11 and Mary Ann, 7 all speak fluent French. Eric, 4 mixes his sentences in French and English. His oldest son, Kevin, 17 started college this year. Russ found his life a rewarding experience living and working in the Swiss town of LeLocle on the French border. Now he and his family have returned to the Boston area and Russ has taken over as general manager of the Jarrell-Ash Division of Fisher Scientific Co. in Waltham.

Erik Klokholm is now with IBM Research Labs, Yorktown Heights, N.Y. . . . **Gerald Lyons**, President of Cheviot Corp., Needham, Mass., is serving as Special Gifts Chairman for the alumni fund in the Boston area. . . . Dr. **Daniel Macero** is Associate Professor of Chemistry at Syracuse University. . . . **John McCarthy** is now vice president of Northeast Materials Laboratory. Joseph Dhosi, '59, is president and Professor Nicholas Grant is a staff consultant of the firm. They specialize in long term creep and rupture testing and analyses of the new alloys being used in the aircraft industry.

Kenneth McCorkle now serves as a part-time Associate Professor of Chemical Engineering at the University of Tennessee in addition to his research duties at the Oak Ridge National Laboratory. . . . **Fred Piemenos** writes from Lexington, Mass., that he has started his own business: Delta Securities Management Corp., of which he is president. They specialize in management of individual investment accounts. . . . **Arnold Rothstein**, S.M. XV, is now director of programs and marketing for Deepsea Ventures, Inc. This new oceanographic subsidiary of Tenneco Inc. is involved in searching the ocean floor for mineral deposits and in the developing of refining processes to recover nickel, copper, cobalt, and manganese.

Howard Simmons recently gave a talk to the Organic Chemistry Group, National Bureau of Standards, on the structure of macrobicyclic molecules. Howard is still Research Supervisor, Central Research Department, E. I. duPont de Nemours. . . . **Ed Stringham** has started a subsidiary, Cues Inc. in Orlando, Fla., of which he is president. The firm will manufacture sewer inspection and maintenance equipment, including small diameter closed circuit TV's and propelled hydraulic pipe cleaners. Ed is also president of the parent company, Penetryn Systems, Inc., a specialized structural restoration service company. . . . **Dan Sully** has resigned the presidency of Moore Associates, Inc. and is now acting as an independent management consultant to small electronic and computer oriented companies. He lives in Palo Alto, Calif.

Wheaton Vaughan is now vice president-business development for Honeywell Inc. in Minneapolis. He and Beverly have one daughter, Cynthia age three. . . . **Herbert Vaughan, Jr.**, a professor of neurology at Albert Einstein College of Medicine, Yeshiva University, and a frequent contributor to technical journals, recently authored an article in *Science*, "Averaged Evoked Responses in Vigilance and Discrimination: A Reassessment," describing experiments of electroencephalogram responses to various stimulus parameters. . . . **John Wright** was given the first publications awards dinner by the Naval Research Laboratory in Washington for his report, "A New Model for Sea Clutter," which appeared in the *I.E.E.E. Transactions on Antennas*



R. W. Osborn, '51

and Propagation. . . . This issue's notes are marked by a rather interesting distinction, beyond the initial news item. For your secretaries found that this issue contained a large number of items about classmates whose names had never before appeared in these columns. We hope that this establishes a trend, and look forward to hearing from the many more of you who, in almost 20 years, have never checked in! The rest of you, don't stop.—**Paul Smith**, Assistant Secretary, 11 Old Farm Rd., N. Caldwell, N.J. 07006; **Howard L. Livingston**, Secretary, 358 Emerson Rd., Lexington, Mass. 02173; Assistant Secretaries: **Marshall E. Alper**, 1130 Coronet Ave., Pasadena, Calif. 91107 and **Walter O. Davis**, 346 Forest Ave., Brockton, Mass. 02402

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After a lack of information for some of the past issues, this month we have a surplus. Especially encouraging is the large number of personal notes from members of the Class. . . . At least one of our classmates is doing something besides keeping his nose strictly to the grindstone. **Arnie A. Kramer** writes that he spent several weeks during the summer of 1969 on the Fiji Islands, Tahiti, and Bora Bora. During the summer of 1968, he visited Yugoslavia, Hungary, Rumania and Russia. Perhaps all this traveling is possible for Arnie because he is still single. His other activities include skiing, tennis, and amateur acting, and we should note that he has received a certificate of Appreciation from M.I.T. for his work as Regional Chairman for the Worcester, Mass. area during the 1969 Alumni Fund campaign. . . . The only other report of vacation activities comes from **Dick Lyle** who spent June, July, and August on assignment at Chevron Central Laboratories in Pernis (Rotterdam), Netherlands with his family. He indicates that his family enjoyed life in Holland and the chance to follow him on his trips to London, Paris, and Frankfurt. Dick also says that he was Chairman of the September 1969 "Symposium on Deposit, Wear, and Emission Control by Lubricant and Fuel Additives" for the American Chemical

Another Chevron Research worker is **Nick Haritatos**. Nick reports that he and his wife, Nancy had a daughter, Edith Emily last July. Dick is now working in the petroleum process design section of Chevron Research. . . . **Bill Whittington** writes that he has been Technical Director since 1962 at Sterling Foundry Co., Wellington, Ohio. Sterling Foundry is a subsidiary of Warner & Swasey Co., Cleveland. Bill and his wife have a daughter age 13. Bill is still an M.I.T. Educational Counselor for his area, but no one that he has interviewed has been accepted yet. Better luck this coming spring, Bill. . . . **Jim W. Davidson** writes in to thank the secretary for taking on the job. Those thanks are much appreciated, but I think perhaps four years premature. Jim and his wife, Marcell and children, Lea, 10, and Joe, 8, are enjoying life in Larchmont, N.Y. where Jim is with a management consulting firm helping companies develop plans of a meaningful nature. . . . An invitation to all classmates has come from **Louis P. Deis**. Louis writes that he has moved to Opelika, Ala. where he is Plant Manager of the Ampex Magnetic Tape Plant. He indicates that he would be happy to have classmates drop by.

The first indications that we have classmates in the securities business arrived in this month's mail. **Stanley Goldberg** writes that he joined Schwabacher & Co. in July 1966. Schwabacher has been part of Blair and Co. since March 1969. Stanley says that he is enjoying the money game very much as it is played in Los Angeles. As we know, that is somewhat different from the way it is played in Boston. Stanley, his wife and four children are living in Brentwood, Calif. **Robert W. Danforth**, Vice President-marketing of LITE Control Corporation of Watertown, Mass. has brought the Marblehead, Mass. summer sailing season to a successful close. Bob successfully introduced a modernized fiberglass hull to the international 210 class by winning the combined summer series conducted by the Marblehead Racing Association. . . . Also a note came from **Theodore M. Parsons** who is now Assistant Vice President, Corporate Finance Department, E. F. Hutton & Co., Inc.

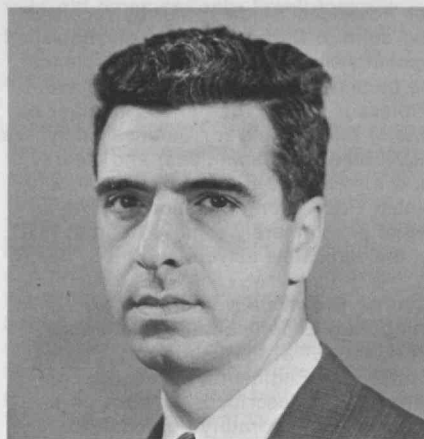
Some members of the Class are still in the business of research and engineering. **Peter H. von Hippel** is now Professor of Chemistry and Director of the Institute of Molecular Biology at the University of Oregon. Peter is doing research on mechanisms of DNA-protein interactions and other aspects of molecular biology. His wife is practicing psychosomatic medicine. . . . **Leon M. Polinski** says that he has been elected Director of the Catalysis Society of N.Y., and he recently wrote a chapter for *Advance in Catalysis* Vol. 19: November 1969, Academic Press, titled "Dynamic Methods for Characterization of Adsorptive Properties of Solid Catalysts." Leon is Chief Process Engineer at Givaudan

Corp., Clifton, N.Y. . . . **Leith Holloway** is also still single and is working for Geophysical Fluid Dynamics Lab of E.S.S.A. (Department of Commerce) which moved to the Forrestal Research Campus of Princeton University last year. Leith purchased a small house in Princeton. His work activities involve supervision of computer programming of mathematical models of the atmosphere.

Computer programming appears in quite a few notes from the classmates. One from **R. J. Preiss** indicates that he is continuing as Manager of Custom Systems Programming at IBM's lab in Poughkeepsie, N.Y. Ralph was a graduate in Course VI, which for those of you who do not recall, is electrical engineering and he has come some distance in his profession having been elected to the Administrative Committee of I.E.E.E. Computer Group for 1969 and 1970. He is also chairman of the Design Automation Technical Committee and Conference Chairman of the 7th Annual Design Automation Workshop (SHARE/A.C.M./I.E.E.E.) scheduled for June 1970.

Richard E. Cole who received his M.S. in metallurgy with our Class has sent in a clipping from the *Reynolds Review*, a company publication, which describes his activities with Reynolds Metals. Dick joined Reynolds after graduation from M.I.T. and has served them as General Foreman, Assistant Superintendent, Plant Superintendent, Industrial Engineer, Assistant Plant Manager, and Plant Manager while working in various areas including a spell with Reynolds International Inc. in India. Presently Dick handles coordination of the activities of seven reduction plants including areas such as production demands, future planning, personnel planning, and coordination between the reduction plants and other divisions of the company.

Those of our Class in the management field are as usual making a great deal of news. A note from **Philip H. Smith** reports that he has had a very busy year since taking over as President and Chief Executive Officer of Copperweld Steel Co. with executive offices in Pittsburgh, Pa. Phil makes his home in Warren, Pa. where he and his wife are now raising five children. . . . **Clyde Baker, Jr.** writes that he is Vice President and Chief Engineer of Soil Testing Services. He and his wife have three children—Mark 9, Lynn 7, and Glen 5. . . . A note from **Eusebio Ruiz deLuzuriaga** informs us that he has just been promoted to President of GT&E Industries, Inc., a local manufacturing and marketing subsidiary of GT&E. Luiz has six children, 3 boys and 3 girls, of whom two intend to go to M.I.T. Eusebio resides in Makati, Rizal, Philippine Islands. . . . **Nick Melissas** whom most of you know as having been very active in class activities, has been named Vice President and General Manager of Microdot Inc.'s Everlock Division, Troy, Mich. Everlock designs and manufactures an extensive line of engineered fasteners primarily for the



J. F. Alibrandi, '52

automotive and appliance industries as well as for communications, construction and railroads. Prior to joining Everlock, Melissas had been Sales and Marketing Vice President of the J. L. Thomson Rivet Corp. in Waltham, Mass.

Bradford W. Edgerton has been named Director of Engineering at Trans-Sonics, Inc., Burlington, Mass. Brad was previously Vice President and General Manager of the Systems Division of Dynamics Research Corp., Wilmington, Mass. . . . **William T. Dacey** has joined Johnson and Higgins, Insurance Brokers employee benefit plan consultants, as Assistant Vice President in the employee benefit department. Mr. Dacey spent the last 13 years with New England Life Insurance Co., most recently as Director of Group Pre-sale Underwriting.

Joseph F. Alibrandi has been elected Senior Vice President of Raytheon Company and continues to serve as General Manager of the Missile Systems Division with headquarters in Bedford, Mass. The Missile Systems Division, Raytheon's largest employs 16,000 persons in Bedford, Andover, and Lowell, Mass; Bristol, Tenn.; and Oxnard, Calif. Joe joined Raytheon in 1952 following graduation from M.I.T. with an S.B. in mechanical engineering. He was named Manager of the Lowell plant in 1961. He became Assistant Manager of the division in 1964 and General Manager the following year. He has been Vice President since 1964.

Edwin H. Porter, Jr., writes that he is still with the Instrumentation Laboratory at M.I.T. as Associate Director and Program Manager for S.A.M.S.O. and O.A.O. Edwin has 7 children ranging in ages from 14 to 2. . . . Astronautics and Aeronautics has named **Franklin O. Carta** of United Aircraft Research Laboratory an Associate Fellow of the Society of Astronautics and Aeronautics. Frank received his S.B. and S.M. degrees in astronautical engineering from M.I.T. and is Senior Research Engineer with United Aircraft Corp. in East Hartford, Conn.

It is not with any intention to make anyone feel particularly ancient but your

secretary would like to point out that coming up in two years is our Class' 20th reunion. The reunion is now scheduled for June 10, 1972. **Mike Nacey**, chairman in charge of organizing the reunion, has made tentative plans to hold it on the island of Martha's Vineyard. The facilities of the Harborside Inn in Edgartown, Mass. appear to be more than satisfactory as a site for this occasion. I have a very attractive brochure showing the blue water and multicolored sailboats with a quaint view of Edgartown in the background. All of this surrounds the Harborside Inn. Please write with suggestions and comments regarding the activities that would be suitable for the reunion and also your reaction to the choice of Martha's Vineyard as a location. I hope also that you are mentally reserving time from your busy schedule to attend this affair. . . . Please don't let the length of this month's column keep you from taking pen in hand and writing your secretary any news you have to communicate whether it be professional or personal. If you are tired of reading about your classmates becoming vice president of this company and president of that, it is only because the mail does not contain sufficient personal data to displace the more illustrious members of our class and their activities.—**Arthur S. Turner**, Secretary, Lowell St., Carlisle, Mass. 01741; Baird-Atomic, 125 Middlesex Turnpike, Bedford, Mass. 01730

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So far we have not received any expressions of interest (or disinterest) relative to the possibility of having our 20th reunion in Bermuda. The Class of 1949 had its 20th in Bermuda this past June. The next edition of class notes will contain information about the costs and general program that the Class of '49 followed for their Bermuda trip.

M.I.T. Homecoming is June 14 and 15. An M.I.T. Night-At-The-Pops will be held on June 14. For all classmates within striking distance of Boston, please keep in mind the good music and pink champagne that will be available.

Tom Faulhaber has been recently appointed to a key position with the American Society of Bakery Engineers. Tom is with an architectural firm in Boston, Ganteaume & McMullen, Inc. . . . **Howard E. Wing, Jr.**, has recently been named Director of Product Research for Raytheon Company. Howard took a year's leave of absence to attend a middle management course at M.I.T. as a Sloane Fellow. Howard and his family live at Pilgrims Path, Sudbury, Mass. He and his wife, Florence, have two children. . . . **Maurice Gionfriddo**, our class agent, received a Certificate of Appreciation for his excellent efforts on behalf of the M.I.T. Alumni Fund for 1969. . . . **Burton Rothleder** was 1969 Alumni Fund Chairman for the Pittsburgh-East area. . . . **Chuck Buntschuh** has recently joined K.E.V. Electronics Corporation as Senior Research Physicist. During the past five

years, Chuck served as Senior Research Engineer with Microwave Associates, Inc. You may recall that Chuck was stroke on our very successful light-weight varsity crew. The Buntschuh family lives at Ten Acre Drive, Bedford, Mass.

Received interesting card but with no name—who could it be?: Who has four sons with one just entering Swarthmore College; who is still building submarines for a living; who sails boats for fun, whose wife, Betty, received her master's degree from Rhode Island University, and who (presumably not Betty) is due to launch a 30-foot sloop in May, 1970?

Ed Leonard recently received the 1969 Allan P. Colburn Award from the American Institute of Chemical Engineers, in recognition of his excellence in contributing to the Institute's publications by younger members. This Award included \$1,000. Ed is a Professor of Chemical Engineering at Columbia University; he also is active in various New York hospitals in the design and use of artificial organs. We are most pleased to know that one of our classmates is working in such an important field. . . . **Joe Myers** has been recently promoted to Senior Programmer at I.B.M.'s Systems Development Laboratory at San Jose, Calif. Joe and his wife, Garnette, have three children. . . . **Steve Dermatis** is now Engineering Manager for Semi-Conductor Materials at Alpha Industries, Newton, Mass. . . . A good man to renew acquaintances with is **Fletch Hosmer** who is now a Vice President with the investment banking firm, First Boston Corporation (New York).

Our Class had its share of new associate Fellows among those recently named by the Association of Astronautics and Aeronautics: **John Calligeros** and **Andrew Lemnios** of Kaman Aircraft and **Charles Zraket** of MITRE Corporation. . . . **Sven Treitel** continues to be an important figure in the Society of Exploration Geophysics. Sven and another M.I.T. graduate, E. A. Robinson, '50, were 1969 Medalists for their contributions to the digital processing of seismic data. . . . **Mark S. Tobin** is now an M.D. associated with the New York Medical College. Mark has been actively involved in the study of leukemia and is affiliated with the Brookdale Hospital Center in Brooklyn. . . . **Howard Hill** writes that he continues to be Regional Technical Manager with the Petroleum Chemical Division of du Pont in Chicago. He and his wife, Bea, have recently had a third daughter who was born this past December.

A. E. J. Gallagher has just completed a one-year assignment on the Island of Bougainville, Solomon Islands (of World War II fame) as company representative during pilot plant test work on a large copper project. Al now lives in Berkeley, Calif. . . . **Melvin Epstein** has recently shifted positions from Aerospace Corporation to the K.M.S. Technology Center in Van Nuys, Calif. . . . **Chuck Forman** writes that he still is active in

community activities in the Chicago area. On my last meeting with Chuck about a year ago, he was working for Abbott Laboratories. His extracurricular activities include the M.I.T. Educational Council, Director of M.I.T. Club of Chicago, and Director of the Chicago Section of the American Institute of Chemical Engineers. While at Tech, one of Chuck's side interests was memorizing license plates and train schedules. . . . **John Austin** has joined the staff at Clemson University as Professor of Environmental Systems Engineering.

Al Pierce is now Associate Professor of Aerospace Engineering at Georgia Tech. Al's wife, Myra, is also an M.I.T. graduate (1959). . . . **Tollyn Twitchell** is now senior partner of a new architectural planning firm in Sarasota, Fla. The name of the company is Twitchell, Allen, Gulak, and Collins. The Twitchells have five children. . . . Speaking of consulting firms, **Jim Best** has recently established his own consulting firm of Best & Associates in Miami, Fla. Formerly, Jim was Executive Vice President of Pearlson Engineering Company, which dealt with the engineering development of drydocks and heavy duty transfer systems. His new firm will offer consulting services in drydocking, heavy steel fabrication, and so forth.

Bill Rice has been living in London since, August, 1968, as an atomic energy attache at the American Embassy. Bill and his family are very much enjoying their experience abroad. . . . **Bill Gouse** is now on leave of absence from Carnegie Mellon University. He serves as technical assistant to the Director of Office of Science and Technology in Washington, D.C. . . . **Marty Wohl**, another new Washingtonian, apparently finds that his avocation of girls is encouraging him to make frequent changes in professional activities. Marty is now Director of Transportation Studies at the Urban Institute in Washington, D.C. It is rumored that, as part of Marty's responsibilities, he helps to arrange transportation for young ladies from the country wishing to take up residence in our Nation's Capital. Marty says that his work leaves little time for sleep. . . . **Al Pruszanowski** has recently left his position as Deputy Director of Technical Services for the American Institute of Aeronautics and Astronautics in New York City. Al says he is presently seeking a better challenge, and he can be located at his home at 640 Pelham Road, New Rochelle, N.Y.

We have quite a few changes of address since late last year. A selection at random is as follows: Ronald F. Harris is now living in Florissant, Mo. (4621 Whisper Lake Drive); Herbert P. Kent is now living in Hawaii (Box 471, Wailuku); Maury Torti now lists his address at 43 Commercial Wharf, Boston, Mass.; Justus Gilfillan, Jr., is now living in Jeffersonville, Vt.—what are you doing in Vermont? Is there room on the farm for any of the rest of us?; Steve Dermatis is now living in Winchester, Mass.—Steve

is a member of the Alumni Council; George Dausman now lives in Oakton, Va. (11218 Country Place); Ed Kingsbury is now living at West Newbury, Mass.; Armand Lopez is now in Caracas, Venezuela; Lieutenant Colonel John Roop is now stationed at Fort Leavenworth, Kansas; Richard Crowell is now at 2550 Wohl Drive, Lexington, Ohio; Thomas Kelley, our Class's own Johnny Cash, continues to live in the Pittsburgh area. His new address is 103 Sanhurst Rd., Pittsburgh, Pa.; Bob Kane, now Professor, lives in Honolulu, Hawaii (4246 Sierra Dr.); Eugene R. (for Riverboat) Hilton now lives in Reno, Nev. (Box 5613); Wasn't Tom Perkins one of our better swimmers at Tech? Tom now lives in Portola Valley, Calif. (177 Boulevard Lane); Mrs. Joan Mizer now lives in Bloomfield Hills, Mich. Joan, was your former last name Fleckenstein?; George Fuld, formerly Professor of Food Technology at M.I.T., is now living in Pickwick Village, Maple Shade, N.J.; Steve Kliment now lists his address at 120 East 81st St., New York, N.Y.; John Shine now lives in Louisville, Ky. John, are you still a bachelor?; David Klepper now lives in Westmont, Ill.; Earle Stewart is now Professor at North Dakota State University at Fargo, N.Dak.—With best wishes for the New Year.—**M. C. Manderson**, Secretary, Longley Rd., Groton, Mass. 01450

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Thomas Bird is continuing his work in the planetary portion of the space program at JPL in Pasadena. He is primarily involved with the scientific payloads to be flown to Mercury and the outer planets. . . . **Peter Butt** is wearing two hats these days: one as president of the Manila Cordage Company; the second as president—FNSP (Philippines) Inc. . . . **R. M. "Corky" d'Oliveira** has been named plant manager of Southwire Company's Rod and Cable Mill in Hancock County, Kentucky. A Commander in the U.S. Naval Reserve, he brings seven years of experience in the wire and cable industry to the new position, as well as eight years of active navy service during which he was associated with several naval shipbuilding projects including the navy's first nuclear powered cruiser.

Alex Dreyfoos writes that Florida living is great and looks forward to seeing any old friends who may get down there this winter. He and Joan are now settled in Palm Beach. Photo-Electronics Corp., the business they started a few years ago, continues to grow and the new 21,000 square foot plant is in full operation with 80 employees. . . . **Henry Hirsch** writes: "I have recently returned from what Sir Harry Lauder used to call my "annual farewell tour" to Boston. Unfortunately, I couldn't leave Lexington in time to make the reunion, but I did get to M.I.T. for the international biophysics meeting. On the way I stopped in Pittsburgh to see Jack Maier, '54, and on last year's "tour" I saw Marvin Turkanis, '53, in Washington. Jack and Marvin and their families looked well and happy, as befits a Tech alumnus."

Chuck Masison now reports to Raytheon's Division Vice-President as Manager of the Advanced Systems Office, where he is responsible for major new business acquisition and management. He reports a recent ride in the navy's deep-diving submarine, *Dolphin*, in which they submerged to fire practice torpedos. Chuck, our ex-class president, is still active in alumni affairs as a member of the Alumni Council Program and Membership Committee; he is helping to create this years Alumni Council program.

Robert Warshawer, our current class president, is Program Manager on a small communications system for the military at Raytheon's Norwood, Mass., Communications Data Processing operation. Bob met **George Filak** and **Gerry Wayne** at the Alumni Officers' Conference. Gerry is teaching in New York; George is Division Controller at Texas Instrument's Chemical Division and active in alumni affairs as President of the M.I.T. Club of Dallas, Texas. Bob also met **George Lampke** at a meeting of the Society of Israeli Philatelists. George is working in Raytheon's TPN-19 program office.

David Wiesen reports that he and Muriel had a son, Sloan Chase, last March and that their "time is somewhat occupied with him at present."—**E. David Howes, Jr.**, for **George Inada**, Secretary, 6001 Chatsworth Lane, Bethesda, Md. 20014

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One resolution that I hope we all made for this year was to try our best to attend the reunion scheduled for the weekend of June 12 through June 14. A number of people with whom we have been in contact are sending chain letters, making telephone calls and planning on their own mini-reunions with the group at that time. In addition, the Homecoming program on June 14 and 15 will provide an opportunity to reacquire yourselves with the campus. Although the physical changes over the past 15 years are certainly significant, it is the political and social consciousness that has become so much a part of the academic environment that may be of greater interest and importance to us as M.I.T. Alumni and human beings.

Betsy and **Philip Eisner** have announced the birth of Edward Cole on September 23. Phil received his Ph.D. in physics from N.Y.U. in June 1969 while he was on a four-year leave of absence from work at the Dewey Electronics Corp. in New York City.

In the spring of 1969, **John Blake** joined the Raytheon Submarine Signal Division, Marine Research Laboratory, in New London, Conn., as Principal Engineer and Technical Director, Marine Ecology. His work involves the direction of ecological/environmental studies of existing and potential pollution of rivers, estuaries and coastal area under the sponsorship of both industry and government. He is particularly concerned with selection of sites for power stations and other industries so that optimum water use will not interfere with beneficial uses by other groups.

Colonel **Leonard R. Sugerman**, U.S.A.F., has been elected Executive Vice President of the Institute of Navigation.

William Chandler, who probably is the only one we know who has been with the same employer since 1955 (except possibly Colonel Sugerman) doesn't seem to be in much of a rut nevertheless. Bill, was recently promoted to Director of Corporate Planning for Potlatch Forests, Inc. in Oregon.



E. B. Roberts, '57

M. L. Singerman, '57

Richard Dangel published a paper, "Integrated Logistic Support Implementation in the Naval Systems Command," in the *Naval Engineers Journal*, August 1969. The paper was originally presented to the A.S.E. Sixth Annual Technical Symposium. In October of 1968, Dick became head of the Integrated Logistic Support System Development Section of the Technical Concepts Office. . . . **Roy Salzman** published a paper, "Trends in the Programming Profession," in *Data Processing Magazine*, November 1968. Roy is with Arthur D. Little. . . . **John Dixon** stays in contact with many M.I.T. architects and planners (both "famous and obscure") as a Senior Editor of *Architectural Forum*. Although John writes that he has "calloused fingers from almost 10 years in architectural journalism," his imagination is still intact as he writes of his apartment "overlooking Brooklyn's magnificent Prospect Park." Carol finds time to teach history in the New York City school system while keeping track of Peter, nine, and Susannah, seven.

Frank Williams of the Marshall Space Flight Center staff was recently cited by NASA for exceptional service in connection with his work relating to the successful manned lunar landing last July. **David Rossin** completed his Fellowship at the Adlai Stevenson Institute involving study of migration of scientists (brain drain) and rejoined Argonne National Laboratory on the staff of the Director. . . . In September, 1969, **John McMaster** was promoted to Program Manager in charge of Aerodynamics, Thermodynamics, Propulsion and Preliminary Design in the Advanced Development Projects Division of Lockheed, California. Your secretaries wonder how you fit this all on one business card. Anyway, best wishes to you, John. We hope you come to the reunion and bring a whole contingent from California.

It is with deep regret that we record the passing of **Louis Frank** of Scituate, Mass. Louis was an unusual member of our Class. He was a veteran of both World Wars and worked for Raytheon and L.F.E. until he retired in 1965 to become a technical writer.—Secretaries: **Mrs. J. H. Venarde** (Dell Lanier), 16 South Trail, Wilmington, Del. 19803; **L. Dennis**

Shapiro, Aerospace Research, Inc., 130 Lincoln St., Boston, Mass. 02135

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Last September **Joel Ewen** joined I.T.&T.-C.E.S.D. as manager of project engineering in New York. He was formerly manager of switching for Telcom, Inc. in Virginia. . . . **Joe Giuttari** is president of Lyon Fabrics, Inc. in Central Falls, R.I. . . . **Charles Krakauer** became president of Acton Labs a year ago after five years as vice president of Rixon Electronics. . . . **Bernard Kupferschmid** became a partner and member of the management consulting staff of Peat, Marwick, Mitchell & Co. in 1968. Specifically he is in charge of activities in Latin America.

Fred Lupi and his wife, Carolyn, became parents of twin sons, Kenneth and William, St. Patrick's Day 1969. . . . **Bill McNulty** has been appointed manager of engineering at I.T.T. World Communications in New York. Prior to that he was assistant to the vice president of operations at Selectro Corp. . . . **Rodrigo Botero Montoya** is an economic advisor to the President of Colombia. He was recently quoted in a *Fortune* magazine article on the increasing Latin American government control over operations of U.S. based corporations in those countries.

Larry Moss has completed a year as a White House Fellow and is now Executive Secretary of the National Academy of Engineering's Committee on Public Engineering Policy. . . . **Dick Quinn** is manager—technical administration, R.C.A. Labs. . . . **Dick Shopf** has been appointed executive vice president of administration of New Park Mining Company of San Francisco.—CoSecretaries: **Bruce B. Bredehoff**, 3 Knollwood Dr., Dover, Massachusetts 02030. T. Guy Spencer, Jr., 73 Church Street, Weston, Massachusetts 02193

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News is sparse this month. The mail seems not to have gotten through. . . . **Allen Burgess** has been appointed vice

president for engineering with Beta Instrument Corporation. Allen received his Master of Business Administration from Boston University in 1965. Prior to his present position, he served as Director of Product Engineering for Adage, Incorporated. Allen and his wife, Ann, have two children one 6 and the other 5. Beta Instrument Corporation, in operation since 1962, manufactures a variety of cathode ray tube display equipment used to translate electronic information into visual displays as well as for processing and storage.

Renata Cathou has just been awarded a grant by the American Heart Association. A news release carried the following information: "Dr. Cathou is instructor in the Department of Medicine, Harvard Medical School and Massachusetts General Hospital. Her three-year grant of \$12,650 will support study of the tertiary structure of immunoglobulins. Her research has been supported in the past by the National Institutes of Health, M.I.T. and Harvard Medical School. She has published numerous papers in scientific journals. Through her research she hopes to shed some light on why certain immunological reactions help the body to resist disease and infection and why others cause undesirable results such as organ-transplant rejection or rheumatic fever. Dr. Cathou is married to **Pierre-Yves Cathou**, president of Electrokinoptics, Inc., an independent electronics consulting firm. They live at 100 Memorial Drive, Cambridge."

Malcolm Singerman has been named manager of operations research for Johnson and Johnson. After Tech, Malcolm picked up his M.S. at Columbia University. He and his wife, the former Anne Marie Edwards of Londonderry, Northern Ireland, live with their daughter in New Brunswick, N.J. A recent photo of Malcolm is included on this page. Beside him is **Ed Roberts** who has taken on the chairmanship of Medical Information Technology, Inc.'s Executive Committee. See page 140 of this issue for a more complete story on this new company and the M.I.T. alumni who formed it.

The National Research Council, Washington, D.C., has announced that **Terence Wieting** has been awarded a Resident

Research Associateship at Naval Research Laboratory, Washington, D.C. He will work in optics and spectroscopy. The purpose of the National Research Council Resident Research Associateships is to provide recent recipients of the doctorate an opportunity for advanced training and basic research in the various branches of science and in engineering. Terence received his doctorate from Cambridge University (England) in February 1969.

Richard Douglass has been appointed to the position of Director of Technical Services for Improved Laminated Metals Company (Improved Seamless Wire Company) of Providence, Rhode Island. The company manufactures precious metal laminates in wire, tubing, sheet and strip form for the electronics and jewelry industries. Dick received his masters degree in metallurgy from Ohio State University. While attending Ohio State University, he spent four years at Battelle Memorial Institute in research and development programs involving precious metals. Dick is a member of the American Society for Metals, and the American Institute of Mining and Metallurgical Engineers. He presently resides with his wife and family in Needham, Mass. . . . How 'bout writing. It's lonely over here.—**Frederick L. Morefield**, Secretary, Tiirasaarentie 17, Lauttasaari, Helsinki 20, Finland

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Our class seems to be ushering in the 1970's with a venturesome spirit if the mail this month is any indication. For example, **Earl Rose** has recently joined Syntectics, Inc., in Cambridge as vice president. Syntectics is engaged in the practice, research and training of effective group interaction, particularly as it pertains to creative problem solving. . . . Then, out on the West Coast, **Richard File** has started his own construction company in the greater Seattle area and is building houses and apartments. Dick received his MBA in 1968 from Stanford. He also reports that he and his wife have two children, both boys. . . . At the Swain School of Design in New Bedford, Mass., **Leo Kelley** is teaching courses in the problems of Western Civilization and also a senior literature seminar. Since his Course X days at M.I.T., Leo has become a poet by preference and has also done some graduate level work in history.

T. P. Lin was a visiting senior lecturer of mathematics at University of Malaya, Kuala Lumpur, Malaysia, between June 1967 and February 1968. Between February 68 and August 68 he served as a visiting professor of mathematics at National Tsing-Hwa University and National Chiao-Tung University, Hsin-Chu, Taiwan, China. He is now a full professor of mathematics at San Fernando State College in Northridge, Calif. . . . **Richard Klafter** writes that he "was at Stanford University under a N.A.S.A.-A.S.E.E. science faculty fellowship in systems design where I was involved in a feasi-

bility study and preliminary design of a commuter airline for the 1980's and beyond." . . . Continuing the trend to concern with social and urban problems, **Robert Jones** has transferred to Washington, D.C., where he will be working on a high-speed ground transportation project. . . . **Mel Copen** tells us that since September he has been serving as Associate Dean of the College of Business Administration at the University of Houston. . . . Among recent appointees to the M.I.T. Educational Council is **Leonard Berkowitz**. Leonard is in charge of engineering research for the government research laboratory of Esso Research and Engineering Company and is located in Berkeley Heights, N.J. . . . Another appointee to the Educational Council is **Melford Monsees**.

General Radio Company recently announced the appointment of **Robert Fulks** as chief engineer of the Concord plant. Bob has been with General Radio since receiving his masters' degree at M.I.T. Most recently, he was the group leader responsible for the development of audio oscillators, automatic impedance-measurement equipment, and computer-controlled test equipment. In addition, he has patents pending on a digital automatic-impedance bridge circuit and is jointly concerned with an automatic adaptive counter apparatus.

Irwin Derman and his California-born bride Glenda are currently living in Menlo Park, Calif. He recently resigned his position at Stanford Research Institute after four years there to accept a post with Arcata National Corporation as manager of software development. . . . During the past summer, June 21 to be exact, **David Ela** was married to Patricia Eames, a Fisher Junior College graduate.

James Galbraith, Jr., is currently vice president of Geoscience, Inc., which he joined in 1963 after receiving his Ph.D. in geophysics at M.I.T. . . . **T. M. St. Clair** has been elected comptroller of Koppers Company, Inc., in Pittsburgh, Pa. . . . **McClaran Jordan** has recently been named administrative assistant to the president of American Potash and Chemical Corporation, a wholly-owned subsidiary of Kerr-McGee Corporation. Previously, he served as administrative assistant to the Chairman of the Board of Kerr-McGee.

Ira Schwartz is serving this year as secretary of the New York Chapter of the Society of Photo-Optical Instrumentation Engineers. Last year he served as Chapter Program Chairman for this group. . . . For his outstanding accomplishments in Vietnam, **Martin Victor** was awarded the Vietnamese Civic Action Medal, Vietnamese Medal of Honor First Class, and the Bronze Star. He has now completed his tour there and is currently assigned to the 66th Tactical Hospital as commander at Upper Heyford R.A.F. Base, in Upper Heyford, England. He and his family thoroughly enjoy being in Europe together.—**Michael E. Brose**, Secretary, 199 Sudbury Rd., Concord,

M.I.T.: Medical Information Technology, Inc.

When someday you see M.I.T. listed in the exchange columns of the *Wall St. Journal* it will not be a listing of the Institute but of Medical Information Technology, Inc. (MEDITECH). Three young M.I.T. alumni, Curtis W. Marble, '63; A. Neil Pappalardo, '64; and Edward B. Roberts, '57, are among the founders of MEDITECH, an interdisciplinary approach to providing continuing—and sorely needed—automated information services to medical institutions. "The company's information services are aimed at active patient records—now, where the urgency is," Curtis W. Marble, Vice President-Operations points out.

Real Paper Problems Are No Paper Tiger

Medical institutions, faced with growing record maintenance/retrieval problems (which contribute significantly to the ever-rising cost of medical care), have little choice but to increasingly rely upon automated methods to bail them out. Should the advent of a national health insurance program put on manual hospital information systems a stress comparable to the Medicare tangle, the result could be a nightmare for hospital administrators. Large university teaching hospitals have been able to go it alone with automated programs. But the 200- to 300-bed community hospital—in just as much need—has had available neither the financial resources nor the professional personnel even to begin. Why hasn't technology somehow helped before now? "The problem," said Dr. Jerome H. Grossman, '61, an associate of the firm, "is not the technology, but getting the technology out into the community in a practical, on-going way."

Thanks to MEDITECH several medical organizations can now share a single computer, connecting to it by simple telephone lines. "We have also designed our system so that you don't have to be a computer-oriented person to operate it," said Morton Ruderman, President of "M.I.T., Inc." "A major part of our service is instructing the user so that he can easily operate the equipment. In addition, we show the client how he can adapt his system to handle new or changing tasks."

Specialized but flexible computer applications for use by different hospitals, clinics or laboratories sharing similar needs are considered among the new firm's strongest points. Programs available now include automated patient interviewing, clinical laboratory reporting and hospital census operations. Other programs under development aim at patient management, information retrieval, pharmacy inventory and dietary planning. As each new service proves itself reliable and satisfactory in user environments, it is added to the library of services offered by the company. Each user is thus able to expand his computer



Service programs, such as automated patient medical history taking, are supplied by telephone line connection between terminals at the customer's facility, shown above, and MEDITECH'S on-line time-shared DEC PDP-9 computer.

system to suit his individual needs, balancing medical, manpower and financial considerations. A complete medical information system can eventually be built in this stable, evolutionary way.

The interdisciplinary experience and training represented on the staff of MEDITECH is unique. Professor Roberts, who has received degrees in engineering, management and economics—all from M.I.T.—and who is currently Associate Professor of Management at the Sloan School, is Chairman of the firm's Executive Committee. He serves as a consultant in the application of computers and systems analysis to numerous industrial corporations as well as to the Harvard Medical School and the Albert Einstein College of Medicine.

Mr. Marble, Vice-President-Operations, an electrical engineering graduate, has served as research assistant in bio-engineering at Harvard Medical School and Peter Bent Brigham Hospital. In 1965 he joined the Laboratory of Computer Science at the Massachusetts General Hospital. His responsibilities at MEDITECH include design and development of computer peripheral interface equipment and hardware maintenance.

Dr. Grossman went on to acquire an M.D.

from the University of Pennsylvania Medical School after graduating in Course XXI-B. In addition to his interests in MEDITECH, Dr. Grossman continues at the Laboratory of Computer Science at the Massachusetts General Hospital.

Mr. Pappalardo, Vice President—Systems Development and Secretary-Treasurer, received an S.B. in electrical engineering from M.I.T. and pursued graduate study in computer sciences at the Institute. Formerly a biomedical research engineer at Peter Bent Brigham Hospital, from 1965 to 1967 he was Manager of the Research Computer Center, Massachusetts General Hospital, where he developed real-time information systems and computer language design for biomedical applications. Mr. Pappalardo will direct the company's research and development program for the creation of new applications and will coordinate the implementation of the company's medical services. "Once clients are educated to what computers can do for them, the rest is relatively easy," said Mr. Pappalardo, who started thinking about the formation of MEDITECH four years ago. The firm, now proving its worth with satisfied customers, has a virtually unlimited market open to it. So wisdom may dictate reserving a place in the portfolio for M. I.T., Inc.

Mass., 01742; **Antonia D. Schuman**, 22400 Napa St., Canoga Park, Calif. 91304

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Have I got news for you—listen. **Dick Davidson** is the Chicago Area Regional Chairman for the reunion (June 12 to 14 at the Jug End in South Egremont, Mass., and reservation cards are on their way). Dick is working with Bell & Howell. For those who are interested, Sunday, June 15, is Tech Night at the Pops and we'll be able to get seats together if you order in advance.

Dave Staelin "spent an interesting year at the National Radio Astronomy Observatory finding 2 pulsars, and at JPL working on a satellite experiment." Dave has returned to M.I.T. as an Associate Professor of E.E.; he's married to Ellen Mahoney (Radcliffe '62) and has two "bouncy" children.

Ralph Cuomo was promoted to Director of Computer Systems in July 1969; I'd tell you what company that was with, but I have already reported the condition of the class files, so . . . Any way, Ralph's first child, a daughter named Christina Ann, was born in April 1969. . . . **Larry Kravitz** says that he has "been involved with the evaluation of an air defense gun at Rock Island Arsenal. My wife, Yvette, has accompanied me on my travels. We have enjoyed the arts and scenery along our route." . . . **Larry Elman** offers his annual plug for the New England Air Museum at Bradley Field, Conn., run by the Connecticut Aeronautical Historical Association. Larry is now on the Board of Directors of that group, and is still living in Glastonbury. I fully expect to see Larry come careening into the reunion in a ship that was wisely given up for scrap some 20 years ago. . . . **Barry Karger** is an Associate Professor of Chemistry at Northeastern University in Boston.

Lawrence Swain reports that "after nine years as a DSR staff member in the M.I.T. Electronic Systems Lab (formerly Servo-mechanisms Lab), I will be leaving at the end of October to become the Manager of Advanced Products at Computer Displays, Inc., in Waltham." . . . **Michael Nesson** received his Ph.D. in biology from CalTech in June, 1969; he's now doing postdoctoral research at Oregon State University. . . . **Robert Walsh** is now Patent Liaison Engineer at the Avco Everett Research Lab.

Mike Rosner is a Fellow in medicine at Yale this year and plans to go into practice next year. He and Joan have two boys—Jordan, 5, and Douglas, 3. . . . **Herb Shanzer** is living in Woburn, Mass., and last March joined Sierra Research Corp., as Chief Engineer of the Computer Products Department. . . . **Dave Camenga** sent a long note: "It has been a long nine years. 1960-65 spent at the University of Wisconsin Medical School completing an M.S. in physiology (neuro-

physiology) and the M.D. Internship was at Tufts-New England Medical Center . . . a three-year neurology residency at Washington University-Barnes Hospital in St. Louis followed. I'm now at U.S.P.H.S. Hospital, Staten Island, for two years. My wife May and I have two sons, Craig, 9, and Davie, 5, and anticipate a new arrival at the end of October."

Ralph Harris has opened a Boston office of his firm, Ralph Harris & Associates of North Hampton, N.H. He is currently working on the design of the 863-acre Waterville Estates in Campton, N.H.; he did the design for the summer campus of the National Training Laboratories in Bethel, Maine, and has done residences throughout New England.

Ray Ambrogi has been appointed Plant Manager for Pilot Plant 2 at the Corning Glass Works in Corning, N.Y. . . . **Mike Neidich** was recently promoted to Product Manager—Data Conversion Modules at DDC Division of Tresco Scientific Devices in Hicksville, N.Y. Mike says he'd like to hear from any classmates on Long Island. . . . **Chris Simonson** wrote, "after leaving M.I.T., I spent three years in the Navy at Mare Island Naval Shipyard in California. I went into astronomy at Ohio State University, getting my Ph.D. in 1967. In 1966 I married Miss Jade Lin of Quezon City, the Philippines. We spent the past two years in Leiden, Netherlands, where I worked on radio observations of the Galaxy at the Observatory and Jade programmed the reduction of the OGO-E electron data for the Cosmic Ray Group. Since this September I have been an Assistant Professor in the Astronomy Program at the University of Maryland and we now live in Greenbelt, Md."

There were a lot of classmates registered for the Young Alumni Seminar early in October. Chris was on the planning committee for what turned out to be a very popular topic—How to Start Your Own Business. Unfortunately, although we were both planning to attend, the only "session" we were able to actually get to (except for the one Chris chaired) was the cocktail party banquet.

Don't go away yet—I've got more. **John Hughes** is President of Hughes & MacCarthy Architects and Engineers, Vice President of the South Middlesex Area Chamber of Commerce responsible for the Community Improvement Division, and Wellesley Chairman of the M.I.T. Alumni Fund Personal Solicitation; he and Jean have two children, John and Minne.

Edward Kane was awarded a 1969-70 Guggenheim Fellowship, but that's all I know about it. . . . **John Chato** has been promoted to Professor of Mechanical Engineering at the University of Illinois, Urbana-Champaign. He is currently Chairman of the Bioengineering Committee. . . . **Sara Sindel** received her Ph.D. from the N.Y.U. Graduate School of Arts and Science and is now an Assistant Professor of Classics at Emory

University in Atlanta. She says that she is "primarily interested in the Latin language and literature and in Roman History, but of course I work in Greek Studies as well." . . . That's it for this time, but only because Chris just mixed me a drink. (We are in training for the reunion). The life and times of the Class of 1960 continues next month. Hurry and get your news in. Send the truth and anything you'd like to make up to—**Linda G. Sprague**, 10 Acorn St., Cambridge, Mass. 02139

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My apologies for the two month hiatus. I have been churning out reams of purple prose during these last few months to convince Harvard that I am deserving of a doctorate. Tears and pleading don't work I have found, and this left me no recourse. The worst seems to be over and life is gradually returning to normal.

Social Notes

George Harrison and his wife Karen "have added a St. Bernard named Tiffany to their family." . . . **Fred Schmidt** and wife added a girl—Karen Priscilla—to their family last June 25 to go along with a one-year-old boy, Fred Jr. Fred Sr. goes on: "First a boy, then a girl! How did Eileen and I do it?—Clean living!"

Clarke Swannack had a little girl last May and seems to be very enthusiastic: "We had a beautiful baby girl, Amy Elizabeth, and what a thrill she is! Being a parent is as much fun as being a physicist! I had the honor of being the last man on the machine before the A.E.C. shut down the Carnegie Tech cyclotron—finishing the digitized-chamber computer experiment on nucleon-pair correlations in light nuclei. Will complete Ph.D. within the year, and then into the job hunting maze." Good luck Clarke. . . . Another contributor to the population explosion was **Max Keck**. He acquired a girl—Linda Marie, at the end of October. Max remains active in alumni affairs in Cleveland being on the M.I.T. Education Council; he met classmate **Paul Yaffe** and Joe Hunt, '63, at the regional M.I.T. conference in Cleveland.

Alan Weinberger was married early in 1968 to Miss Nancy Carol Byorick. They were "anxiously awaiting our first child, due 1 December '69" when Alan wrote. He recently moved from Baltimore to Houston to become a member of the technical staff of the T.R.W. systems group there. He is in their Mechanics Department working on the Apollo Program at the Manned Spacecraft Center.

Speaking of Apollo, **Pete Gray** and **Jerry Grossman** were invited by the class astronaut, **Bill Lenoir**, to the launching of Apollo 12 last November. They sat in the V.I.P. section (or so they say). Pete and Jerry are part of an international land holding cartel along with **Dave Ness** and Mike Jablow, '62. This massive land grab began with the taking of a farm in Vermont (Washington, Vermont, to be

exact). The farm is inconveniently situated with respect to nearly all Vermont ski areas. The world has now been given fair warning about the evil designs of this nefarious group.

Capitalist Tools

Ira Jaffe, who masquerades as Class President, started his own law firm (in Detroit, I think) in July, 1968 and says he enjoys the practice of law in his own office "immensely." There are now seven attorneys in the firm and lots of "overhead." . . . **Lenny Coris** has also set up his own company: L. M. Coris and Associates somewhere near Boston. L.M.C.&A. is involved in financial planning for individuals and relatively new companies. Next February Lenny expects to get an M.S. from the Sloan school.

Doctor **Jerry Grossman** is associated with a new firm, Medical Information Technology, Inc., which was conceived and formed by M.I.T. alumni. The story is on pages 140 and 141 of this issue.

Over in Tokyo the **Robert Ried**'s have been "spending a very pleasant 7 months . . . where [says Bob] I am working at the National Aerospace Laboratory under a scientific exchange program sponsored by the Japanese Government Science and Technology Agency. It has been a great opportunity for me to extend my research and to meet many Japanese scientists and engineers in the government and the universities." . . . **Wesley Hilton** has been employed as a sea-going computer programmer. He has taken trips to exotic places like Easter Island, Peru, Chile and Hawaii aboard Scripts vessels. Last April, Wesley married the former Judith King of Glendora, Calif., who must know what it is like to be a captain's wife.

Herb Schaake is in graduate school at the University of Florida in Gainesville working on metallurgical and materials engineering. . . . **Tom Lawford** says: "I am doing my internship in internal medicine until July 1, 1970 at Roanoke Memorial Hospital in Roanoke, Va. Then it's probably on to the U.S.A.F. as an F.M.O. for two years." . . . This note from **Michael Wiederhold**: "Finally having cut the cord after 12 years, I have left M.I.T. and started as a staff fellow at the National Institute of Neurological Diseases and Stroke in Bethesda, Md. After working on cats' ears for eight years I am about to start on the eyes of cherry stone clams!" . . . **William Shaw** finished his Ph.D. in theoretical physics at the University of Washington in Seattle in the summer of 1968 and went off to the Lawrence Radiation Lab at Livermore in their Theoretical Physics Division.

David Pratt says that after he got his M.B.A. from the University of Chicago in 1963 he spent two years with Litton and two more years with S.D.S. (which, I assume, is not the S.D.S. we read about these days). Now he is Manufacturing Manager at Dava Labs which is a small company (350 employees) making digital voltmeters. . . . **Al Klancnik** moved back

to Chicago, leaving Proctor and Gamble high and dry in Baltimore. Now he works for Hi-Lo Manufacturing Co., as General Manager. . . . Also on the move is **Dan McConnell**. He is now in the heartland, where the "silent majority" resides, Iowa City, Iowa. He works at Amana as Product Manager for the Radarange Microwave oven. . . . **Henri Schnurmann** is busily engaged in computer work, such as computer design through simulation (whatever that means) and the study of "automatic test generation for given circuit failures." He has published on these subjects several times in recent months. Keep it up, Henri; whatever it is, I really feel like a clod when you people write about the things you are doing.—**Andrew Braun**, Class Clod and Secretary, 131 Freeman St., Brookline, Mass. 02146

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The response to the questionnaire that was attached to the Class President's letter has started, and is moderate, so I expect that more of you will be responding shortly to keep the Class informed on yourselves.

Kenneth Taylor, of Barrington, N.J., is presently Actuarial Team Head for Small Cases with the Central Actuarial Department of Peat, Marwick, Mitchell & Co., in Philadelphia. . . . **James W. Kesler** of Leesburg, Va., is still working as an engineer for the U.S. Army Scientific Liaison and Advisory Group, in Arlington, and is looking for a private data processing or systems analysis job in Europe, preferably Germany, to start in the summer of 1970. . . . **Francis J. Berlandi**, who earned national recognition during his studies at the University of Michigan where, as a student, he was an instructor in nuclear chemistry and technical management, has been elected to the Board of Directors of Compucord, Inc. in Waltham. Dr. Berlandi received his S.B. from M.I.T. in chemistry, master's degree from the University of Michigan in 1964, and two years later his doctorate in analytical chemistry from the University of Michigan. . . . Mr. **John R. Talbot** will soon be celebrating his first anniversary with his wife, the former Dorayne Umbriet. They were married March 29, 1969 in the First Congregational Church, Westfield, N.J. . . . Effective November 16, 1969, **Bojey C. Salmon** was promoted to Branch Sales Manager at Honeywell, E.D.P., and transferred to Detroit. He completed a three-year assignment as an M.I.T. Education Counselor in Chicago, and was Secretary of the M.I.T. Club of Chicago in 1969; he resigned both positions when he moved but hopes to become similarly active in Detroit.

Bert Bishop writes concerning his past and his present activities. After leaving M.I.T. in 1962 he spent three years as a U.S. Navy Civil Engineering Corps officer in charge of construction at the Polaris Missile Assembly Facility, Atlantic, in Charleston, S.C.; following active duty, he worked for an architectural firm as an

architect-in-training on a variety of projects. After one year of study and review he took and passed the New York State and National Council of Architectural Registration Board's exam for architectural licensing and now is qualified to practice as a principal in all states. He is an Associate Member of the A.I.A., and currently makes his home in Kingston, N.Y.

The Community Development Action Plan agency of Norwalk, Conn., announced the appointment of **David F. Bond** as coordinator of the agency effective October 1, 1969. He had previously been a reporter with the *Norwalk Hour*, for which he covered city governmental agencies. . . . **George W. Meyer, Jr.**, is now doing his first year of internal medicine residency in San Francisco and plans to go into orthopedics. He and his wife welcomed their first child, Robert James on August 18, 1969 and live at 48 Agua Way, San Francisco. . . . **Orrin Getz** writes that he is working for the Hazeltine Corp. in Little Neck, N.Y., was married in July, 1968, to the former Elaine Weissberg, and that he is now attending Long Island University for an M.S. in management engineering. . . . **Melvin Weiss, M.D.**, is now on active duty with the U.S. Public Health Service, stationed in Staten Island, New York. . . . Belated but hearty congratulations to **David E. Nickles** on his February 8, 1969 marriage to the former Joan Majkut—graduate of Simmons in chemistry whom he met in Wilmington, Del., where both of them worked for du Pont. David was transferred to Buffalo, N.Y. for plant start-up in spring of 1969 with the plant to produce synthetic marble (Corian®) one piece vanity tops and bowles in du Pont's Building Products Division.

Peter W. Hartman's, '63, wife keeps us informed as to Pete's doings—as of April, 1969, he joined a newly organized company, Telemation, as director of research and development. The Company is engaged in the development and production of satellite radio receivers, with major sales going to the government.

Since leaving M.I.T. **Peter Maas** has completed a master's in computer science at Stanford (1964) and has also married the former Margot Jena in Rio de Janeiro. Returning to Boulder, Colo., he completed his Ph.D. in physics at Colorado University. His wife, two children and Pete still live in Boulder while he is spending a year at the Colorado University's medical school as a postdoctoral student in biophysics. . . . Another classmate is N.I.H. postdoctoral fellow in the biochemistry department of the medical school at the University of Minnesota, where he is investigating structural problems and properties of ribonuclease. During his spare time, Tom is refinishing and selling early American antiques, while his wife, Jane, is finishing up her doctoral work in math education at Minnesota. That's quite a schedule.

Miville L. Gagnon, Course I, has worked for a year toward a Ph.D. degree and

then for the last six years has been with S.N.C. and Acres Quebec Ltd. (two of the largest consulting firms in Canada), mostly doing work in his field of interest—hydraulics and hydraulic structures.

Harold M. Waller was elected Chairman of the Department of Political Science at McGill University in Montreal, effective September, 1969. Congratulations to Harold and his wife on their charming daughter, Sharon, born May 29, 1969. . . . **Lewis M. Norton**, who moved to Maryland in May, 1969, is now working for Dr. James Slagle in the Henristics Lab, Division of Computer Research and Technology, N.I.H., Bethesda, Md. A research mathematician, his work is computer oriented, concerning artificial intelligence and to a lesser extent, computational linguistics. . . . **Warren Zapol**, who was married in the fall of 1968, refreshes our memory that he is continuing on the staff of the National Heart Institute, and is developing and testing an artificial placenta and exploring fetal physiology. . . . **Gerald Fleischli**, now serving a two-year military obligation as a physician in the U.S. Public Health Service, feels this is an excellent opportunity to apply engineering techniques to an analysis of computerized electrocardiographic interpretation systems.—**Gerald L. Katell**, Secretary, 310 Hoge Building, Seattle, Wash. 98104

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Steven Bernstein was recently elected chairman of the Boston Section of the I.E.E.E. Professional Group on Communication Technology. . . . **Michael Platt** was promoted to product manager of a new Jell-O corporation product. . . . **Dale Miller** is still pursuing a Ph.D. in electrical engineering at Berkeley. He is involved with ultra-high vacuum scanning microscopy. . . . **Benjamin Bossin** is with Sweetheart Plastics in Wilmington, Mass., as an assistant to the General Manager. He reports one son Jefferey, age one.

James Poitras is vice chairman of the Waseeka Wildlife Society (Breeding Habits Study Committee) Mosquito Control Commission, Holliston Board of Public Health in Holliston, Mass. . . . **Gerald A. Nasek** completed his masters at Tech in 1965, his doctorate at Illinois in 1969 and is now an assistant professor at Illinois in the Department of Information Engineering. . . . The tear sheet from **Josef Nathanson's** contribution envelope reports that his contribution was in honor of M.I.T.'s role in last March's research moratorium. . . . **Robert Turtz** received his L.L.B. from Harvard Law School in 1966 and spent the subsequent two years as an attorney with the Atomic Energy Commission in Washington. He is now with the firm of Carpenter, Bennett & Morrissey in Newark, N.J. He has a child one year old, Evan Michael.

Michael Wolfberg has a wife, Julie, whom he met at the University of Pennsylvania graduate school. She is presently a pro-



C. W. Marble, '63



A. N. Pappalardo, '64

grammer at Digital Equipment Corp. while Michael is at Massachusetts Computer Associates in Wakefield, Mass., working with the development of programming languages and computer graphics. He received both his M.S. and Ph.D. from Penn in computer and information science.

Curtis Marble is now Vice President-Operations at Medical Information Technology, Inc., a new firm located in Cambridge. Curt was one of several M.I.T. Alumni who formed the company—the story appears on pages 140 and 141 of this issue.

Robert Schwarcz reports that he is doing research in natural-language processing and computer-aided instruction at the System Development Corporation, Santa Monica, Calif. while finishing up his Ph.D. at the University of Wisconsin. He hopes to join the faculty of Hebrew University in Jerusalem in 1970. . . . **Bernd Hopp** has two children, a boy and a girl. He is employed by the Celanese Corporation as a marketing manager. (Bernd, your abbreviation is not clear. Let me know if I interpreted it incorrectly.) He received his M.B.A. from Harvard in 1965.

Gus Dreier is employed by Helio Aircraft at Hanscom Field in Bedford, Mass., where he is the company's chief flight test engineer. . . . **Rostislav Prymak** is employed by Avco in Wilmington, Mass., where he is a group leader and senior scientist in the Performance Analysis Section. He is working towards his second M.S., this one in engineering management. . . . **Bob Petrich** has re-joined Rohm and Haas Co. after receiving a Ph.D. in polymer science from the University of Akron. He is now living in the Philadelphia area with his wife and son.

Robert Budny is working on his Ph.D. thesis in physics at the University of Maryland. . . . **Joseph Eckard** completed his Ph.D. in nuclear engineering at the Institute and is presently a senior staff physicist with combustion engineering in Windsor, Conn. . . . **Steve Bram** is with Consolidated Edison as a division engineer in their Development Division. He received a M.B.A. from N.Y.U. in 1966 and is now working on a Ph.D. dissertation. In his spare time he teaches on a part-time basis at Pace College.

Stephen Evans lives in Reseda, Calif. with his wife, Sheila Marie, and two girls, Jane Marie and Diana Lynne. He is with Rocketdyne after completing an S.M. in Course XXII.—**Martin Schrage**, Secretary, 305 Massachusetts Ave., Arlington, Mass. 02174

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Bob Clements, who is Project Engineer for the PDP-10 computer at Digital Equipment Corp. had the sobering experience last October of receiving a 5-year tie clip. Off work he enjoys a bachelor's life in the suburban paradise of Waltham, and has written an "information system" for his large rock music collection. . . . This month's Class Hero is **Lita Nelsen** who reports that she and her husband Don (M.I.T. '61) are the proud parents of Katrina Lynn, born September 16. They are also entwined in creeping suburbia with an 80-year-old home, a lawnmower, 3 a.m. feedings, and 175 dirty diapers a week. Lita is now back to work (between diaper changes) as a chemical engineer at Amicon. She deserves oak clusters on her Class Hero badge for reporting the following news of other class coeds: **Ann Katan Goldberg** now has two daughters (Judy, 3, and Jessica, 6 months) and is working for N.A.S.A. in Kendall Square. . . . **Ann Sarney Loomis** is living in Stoughton with her husband David and their three-year-old son Peter.

Martha Harper Redi recently received her Ph.D. in theoretical physics from Rutgers, and is now living in Princeton where her husband Olav, '65, teaches physics.

And now for news of others: **John Bennett** is now in New Delhi with the Peace Corps conducting science teacher's workshops. . . . **Bob Blumberg** was married last March to Joyce Yavner, who is now teaching the fourth grade. Bob is a systems analyst and a first lieutenant with the Department of Defense. Our recently elected V.P. should be out of the service by the time this is published. . . . **Bud Boring** is now an Industrial liaison officer for M.I.T. Bud also heads the M.I.T. Rugby Club, takes oil painting at the Boston Museum of Fine Arts, dabbles in rural planning in

west Texas, and has travelled to Iceland to author magazine stories about that country. As a bachelor, Bud escorted Annie Aueur, a French lass, to the reunion.

John Brown, II, is close to finishing his Ph.D. in plasma physics at Stanford. . . . **Bob Burn** received his Ph.D. in plasma physics at Stanford last June. . . . **Dan Chow** was awarded his M.B.A. from Stanford last June, and has planned to enter management consulting with the San Francisco office of Touche, Ross, etc. . . . **John Freeman** and his wife Margaret were among those attending the reunion. John works in the field of plasma physics at Sandia Corp., and is the secretary of the M.I.T. Alumni Club of New Mexico. . . . **Alan Gamse**, practicing law in Baltimore with a 35-man firm, is specializing in corporate work. He and his wife Barbara are restoring a three story townhouse built in 1859 while at the same time looking after their two-year-old daughter Erin Elizabeth. Alan is the proud owner of a 1949 Mark 6 Bentley Saloon—which he is willing to unload for a rockbottom \$3,500. . . . **Jim Griffin**, our new Class Agent, is now with the First National Bank of Chicago as a loan officer evaluating science orientated firms. He and his wife Jackie will be overseas soon where Jim will help set up part of the bank's operations there.

A. Neil Pappalardo, Vice President-Systems Development and Secretary Treasurer of Medical Information Technology, Inc., is one of several M.I.T. alumni who formed this company last summer. The story appears on page 140 and 141 of this issue.

Leon Kaatz is working in operations research for Naval Analysis in Washington, D.C. . . . **Robert Kimmel** received his Sc.D. last June, and the month before received his degree in fatherhood. . . . **Roy MacKintosh** published an article in last May's issue of *Science* concerning the fertilization of sea urchin eggs. . . . **Jim Monk** is back at M.I.T. working on his M.B.A. after serving in the army in Germany. . . . **David Patterson** is now with the Foreign Service of the State Department. . . . **Richard Posner** is a Hughes Doctoral Fellow at (by pure coincidence) Hughes Aircraft Co. in Los Angeles. . . . **Larry Rabiner** published an article in the March, 1969 issue of the

I.E.E.E. Transactions dealing with a model for synthesizing speech by rule.

Mark Radwin works for Lockheed in Palo Alto in their Information Science Lab. He met his wife Karen by computer matching, and they were married on Independence Day, 1968.

Ed Shibata should have his Ph.D. in physics from M.I.T. by the time this is published. Ed's current means of transportation is a motorcycle. . . . **Bruce Stevens** is with the Engineering Division of Rohm & Haas in Philadelphia. His wife Gail is a textile designer. Bruce is attending classes at Wharton's, dabbling in the local theatre, and participating in various community activities. . . . **Dick Stimets** received his Ph.D. in solid state physics from M.I.T. last June. . . . **Albert Zobrist** received the top award for a technical paper last May at the Spring Joint Computer Conference in Boston. His paper was titled "A model of visual organization for the game GO." And GO is what I shall now do for this month. Let me hear from you.—**Ron Gilman**, 5209 Peg Lane, Memphis, Tenn. 38117

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Richard St. Peters has joined G.E.'s Research and Development Center as a physicist in the Optical Physics Group.

Daniel Diamond completed his Ph.D. work at the Sloan School and is currently the Director of System Development at Codon Computer Utilities, Inc. in Waltham, Mass. . . . **Henry Hsiao** is in the Ph.D. program in electrical engineering at Berkeley and his family now includes two daughters.

Dennis Bekeny reports that **Bob Morgan** has been appointed Assistant Professor and Chairman of the mathematics department at Gordon College in Wenham, Mass. . . . Several '65'ers were appointed assistant professors this past October: **John Hafstrom** in metallurgy, **Amedeo Odoni** in civil engineering, **Donald Smith** in chemical engineering, and **Dick Larson** in electrical engineering.

Doug Spreng has been promoted to Product Manager at Hewlett-Packard's

Microwave Division. Doug will be spending most of his spare time this Spring building a cabin in the High Sierra country near Lake Tahoe, Nevada. . . . **Bill Eilers** has been appointed Director of the National Science Academy's Board on International Development which is concerned with the transfer of technology and program planning in emerging nations. . . . Captain **Fred Doyle** and Captain **Chuck Seniawski** have both received the Air Force's Commendation Medal. Fred has been serving as an aircraft maintenance officer at Bien Hoa AB, Vietnam; Chuck has been a missile officer at Malstrom A.F.B., Montana.

Ron Wilensky is engaged to Miss Melanie Ann Gould of Menlo Park, Calif. Both are completing their Ph.D. work at Stanford, Ron in applied physics and Melanie in music. . . . In June, **Robert Kemper** married the former Miss Suzanne Petterson, a graduate of Concordia College. Robert and **Nick Stepaniuk** are working at the Mallinckrodt Labs in St. Louis. . . . **John Currano** was married to the former Miss Diane Semlow, a University of Chicago alumna, last August. **Leo Lake** served as best man. John is completing his Ph.D. work in math at the University of Chicago and is also teaching at DePaul University. . . . **Alan Ehrlich** reports the birth of a son, Gary Jonathan, in December 1968. Alan is now a Water Research Specialist at Coca-Cola.

Finally, it is with deepest regrets that I report the death of our classmate, **Joseph Mooney**, on March 22, 1969.—**Jim Wolf**, Secretary, Brigham Road, Gates Mills, Ohio 44040

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The latest mail from the Alumni Office includes, once again and I dearly hope for the last time, a number of letters which are concerned about our Class's lack of columns. One of the unfortunate things about these class notes is the built-in time lag in the reporting system. For instance, these words are being written on November 16 from letters written almost exclusively during October. By the time you read this column, it will most probably be mid-February.

So don't be too ready to take out your animosity upon me if something you wrote doesn't appear in print immediately. Also don't wait until your previous letter has appeared before writing again.

Undoubtedly you have read of the panel which looked into M.I.T.'s laboratory research. One of the student members was **Marv Sirbu**, who is still doing graduate work at the Institute in Course VI.

Irwin Miller has just published a book, *A Primer on Statistics for Business and Economics*, Random House. So far as I know, Irwin thus has the distinction of being the first in our Class to publish a book.

Thomas Row worked for Fairchild Semiconductor after receiving his S.M. in materials from M.I.T. He joined Intel Corp. last year and has just co-authored a paper in the *IEEE Spectrum*. . . . **Jon Burkhardt** has just written a lengthy report which examines the transportation problem facing the rural poor of Raleigh County, W. Va. He is working for Resource Management Corp. in Bethesda, Md. . . . Joining these two is **Harry S. Cohen** who has co-authored a paper published in *IEEE Transactions on Man-Machine Systems*. He is presently at M.I.T. working on a Ph.D. in operations research, supported by a research assistantship from the Urban Systems Laboratory.

Virtually all of the papers mentioned in this column each month have been brought to my attention by the Alumni Office. You may have noted over the past couple columns that most of the papers have appeared in electrical engineering publications. In order that the Course VI people don't run away from the rest of us, let me know directly about papers you may have written or co-authored.

A number of "newly-weds" have appeared. **Daniel Smith** married Jean Beetham of Lancaster, Wisc. The formal proposal was made by phone from Curaçao, Netherlands Antilles, while Dan was trying to study the behavior of tropical sea urchins. Hate to have to pay his phone bill! . . . **Walter Shedd** married Eileen Shaffery of Riverhead, N.Y., in June, 1968. He is now at the Air Force

Cambridge Research Labs in Bedford, Mass. . . . **Larry Daley** married Kathleen Shedd of Hyde Park, Mass., on June 21, 1969. He is now a chemical engineering Ph.D. candidate at Cornell. . . . **Roland Pittman** married Susan Story of Levittown, N.Y., in June, 1968. He hopes to finish his physics Ph.D. in high energy physics at Stony Brook this year. . . . Paul Godfrey was married on June 7, 1969, to Maureen Kelly and expects to receive his M.D. in June 1970. . . . **George Bourrie, Jr.**, married in July, 1968, and is an applicant for a Ph.D. in biomedical engineering at Drexel Institute of Technology. . . . Finally, **Tom Van Tienhoven** joined the "marrieds" on September 27, 1969. He took Vera Gittens of Argentina as his bride. They are enjoying their home in Flushing, N.Y., which everyone knows is Mets' country.

Harold Helfand married the former Phyllis Caplow, a Simmons graduate, in 1968 following his graduation from the Sloan School. Currently, he is in the second of two years of active duty as a commissioned officer of the U.S. Public Health Service.

Of course, after marriage come babies. **John Esterl** and his wife have a new son Michael to join a daughter, Jennifer. John is still working on his Ph.D. in chemistry at Berkeley and was a co-author of two papers this year. He also reports that tear gas is awful. . . . **Thomas Gomersal** has a one-year-old son with a brother or sister for him expected in the spring. Tom has one year left with the Air Force. His entire tour of duty was at Warren AFB in Cheyenne, Wyo. He is attending classes at Colorado State University in Fort Collins and plans eventually to get an M.S. and Ph.D. in statistics.

As expected, our Class has a great number of people in graduate schools around the world. **Stu Shapiro** is writing his Ph.D. thesis in computer sciences at Wisconsin. He spent last summer doing computational linguistics for Rand, where he had also worked the previous summer.

Edward Steinberg received an M.A. in economics at N.Y.U. last June and is now working toward his doctorate. . . . **Ralph Davison** is in his fourth year of grad work at M.I.T. in metallurgy. He is the Graduate Student Council President for this year as well. . . . **William Dietrich** is into his final year of the M.B.A./J.D. program at Columbia. . . . **Alfred Stone** is still a grad student at Harvard in chemistry.

Joe Adolph is in his last year of medical study and looks forward to a career in surgery. This summer he visited England and France with his wife. Also touring Europe was **Chester Scjneider** who bumped into Don Berliner '67 and **Barry Skeist** at the Tower of Pisa and **Bill Marlow** at a hotel in Munich. This year Chester is at the Institute for Advanced Study in Princeton.

Robert Atkins hopes to finish his Ph.D. in

chemistry by September and then plans a postdoctoral year at Columbia. . . . **William Moss, 3d**, is an instructor at the U.S. Naval Nuclear Power School and is working toward a Ph.D. in math at Delaware. . . . **Alan Dinner** expects his Ph.D. in June, 1970. . . . **Paul Lafata** finished his M.S. in computer sciences in January, 1968, at Wisconsin and is now pursuing his Ph.D. . . . **Gervasio Prado** has stayed at M.I.T. to work for a Ph.D. in electrical engineering. . . . **Monty Graham** has been working as a case-writer at Harvard Business School while getting his Ph.D. He has had the opportunity to work closely with Wickham Skinner and George Cabot Lodge while writing cases. He occasionally sees **Tom Jones** who is also a casewriter and doctoral candidate there.

Donald Haney received his Ph.D. in engineering management from Clemson University in May, 1969. In January he enters the Air Force at Kirtland AFB, N.M. . . . **Terry May** is a 2nd Lieutenant stationed at Fort Sill, Oklahoma. . . . **James Lash** is the new Assistant Dean of the Tulane Graduate School of Business Administration in New Orleans. He took his new post on June 1, 1969. . . . **Richard Wolf** is a market engineer on the L-1011 for Lockheed in Burbank, Calif. He is also involved in outside work on pollution and civil systems analysis.

Peter Addis is a systems programmer in the Univac Systems Section of Raytheon. He is also taking courses at Lowell Tech in computer sciences. . . . **David Littmann** received an S.M. in economics and is now a systems analyst for Burroughs Corp. . . . **Barbara Uhrmacher** is a programmer for Scherring and her husband works for Esso Engineering.

John Hoche spent two months last summer in Gbarnga, Liberia, studying tropical medicine at a mission hospital as an elective at Columbia Medical School. . . . **Mark Yogman** has just started a one year assignment in the Esso Math Training Division, giving courses in linear programming to company employees around the world. . . . **Paul Branstad** is a section manager for Litton Industries Marine Division supervising economic and systems analysis studies in marine transportation. . . . **Jon Meads** was recently appointed Vice President of Technical Services for Vision Systems, Inc. where he also serves as a senior graphics systems consultant. . . . **Bob Klein** has only a few months left in the Public Health Service where he is working on N.I.H. plans for medical school construction. He reports his brother has just pledged ZBT at M.I.T.

Timothy Carney wins the Hero of the Month award for his report: "I've taken up duties as International Relations Officer at the American Embassy in Maseru, Kingdom of Lesotho. I arrived August 7, toward the end of a bitterly cold winter, made even colder by lack of central heating. Taking leave of Saigon, I visited friends in Bangkok, Karachi, Munich, where I bought my car, and

London. I only spent three weeks in the States but did manage to talk to June and **Dan Allen**. Harriet and **Jerry Abraham** wrote recently that they have a new daughter, Melissa Ellen. Lesotho (ex-Basutoland) is a landlocked country surrounded by the Republic of South Africa. It is a majority rule constitutional monarchy."

A close runner-up was the person who wrote: "**Bob Burton** is serving in the Public Health Service in Washington, D.C. **Chris Egolf** has finished some VISTA work in New Orleans and is now working for F.M.C. in Carteret, N.J. **Sam Wagstaff** is continuing work at Cornell on a Ph.D. in math. **Sarosh Sukhia** got an M.B.A. from Rochester and is now working for Allied Chemical in Manhattan. . . . **Richard Brady** is continuing work on his Ph.D. in physics at Maryland." In addition to being a comprehensive reporter, the writer is also a very modest person. He forgot to sign his name! Cheers—**Terry J. Vander Werff**, Secretary, 24 Horwood Close, Oxford, England

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As I was on vacation last month in London and Amsterdam, I didn't get around to writing any class news. As a result this column might be a little longer than usual. **Ray Giglio** writes that after two years he actually has something noteworthy: on August 2 he married Marsha Hunt, Boston University, Sargent College, '66. They reside in Acton while Ray works at Avco Systems Division in Wilmington, where he spends most of his time doing radiation hardening. . . . **Steve Marcus** is in his third year at Harvard Law School. He beat the draft by joining Harvard's infamous Army R.O.T.C., but paid for his sins by spending six weeks during the past summer in misery at the R.O.T.C. summer camp in Indiantown Gap, Pa. The only good thing he has to say about this is that it is over. Steve represents half of M.I.T.'s contribution to the Harvard Law Review, the other alumnus being Mike Rodberg, '68.

Bonnie Gerzog and her husband Nash-Webber, a South African citizen, have been living in Cape Town for over a year. Bonnie writes that she has as many good things to say about South Africa as about the United States and that South Africa is really the world's whipping boy, a position it doesn't deserve. "No, I'm not defending apartheid, and especially the vicious daily insults of petty apartheid-like separate buses and beaches, but people wouldn't be so certain of answers for South Africa's problems if they took the trouble to come here and realize what they are." Bonnie is lecturing and acting as department secretary for the University of Cape Town's new Department of Computer Science. As they are short of staff, Bonnie writes that there are opportunities for any computer buffs who may want to see a beautiful part of the world and take her up on seeing South Africa's problems first hand. Domestically, she and Nash are the proud

parents of a dog, two cats, five kittens, a turtle, and a fig tree.

Having received her S.M. in crystallography from M.I.T. in 1968, **Martha Redden** went to Cambridge University in England to begin research toward a Ph.D. She writes that she is engaged to be married this December to Cook Kimball, a graduate of Harvard who is also studying at Cambridge. . . . **Larry Banks**, having received his S.M.E.E. last February, went to work for Hewlett-Packard Medical Electronics Division in Waltham, where he is working on a fairly large-scale electrocardiographic diagnostic time-shared computer system for helping heart patients and clinics. In July he married Elizabeth Stauffer, Adelphi University, '69, who's now working in the psychology department at Boston University. Thanks to a I-Y, Larry has been staying out of the army, but he has heard that a lot of men with I-Y's from his home town have been called up. He will probably resort to a II-A if necessary.

Keith Patterson has been named educational marketing specialist for Digital Equipment Corporation's PDP-10 time-sharing system. He is responsible for development of computer related products for educational institutions. Previously Keith was a systems analyst for Control Data Corporation in Minneapolis and London. . . . **Fred Anderson** received his M.B.A. at the University of Michigan and went to work for Container Corporation of America in Carol Stream, Ill. He is a project engineer in container product research and development. . . . **Larry Aronberg** has completed basic training at Fort Gordon. . . . **Edward Kirsch** is in his third year at San Francisco Medical School. . . . **Don Mattes** received his M.S.E.E. from M.I.T. in June and is presently working for SPACETAC, a very small electronics company located on the Route 128 electronics belt. He is in charge of the company's line of low power microelectronic logic modules for spaceflight applications.

Henry Seltzer plans to return to Boston after finishing his one-year tour in Vietnam. . . . **Rasiklal Shah** is participating with General Electric in transportation studies and in various simulation problems, including a recent one on the human cardiovascular system. . . . **Stan Rose** received an M.S.E.E. last June and has been appointed Assistant Director of the Laboratory of Computer Science at Mass. General Hospital. He is in charge of the system software and hardware for three medical application time-sharing systems. . . . **Norman Wagoner** tried twice for a B.Arch., but is now working and enjoying it. . . . **Bob Katz** is a systems marketing specialist with Digital Equipment Corporation in Maynard, Mass. Bob previously was involved in marketing and systems analysis activities for Universal Studios of Hollywood.

Robert De Bonte, after a summer of programming for the High Energy Department of Purdue University, has begun

research for a Ph.D. in high energy physics. He and his bride, Pam Laswell, spent their August honeymoon in Boston and New Jersey. . . . **Leonard Zucker** is in his third year at Harvard working on his math Ph.D. In June he married the former Barbara Lisker, Simmons, '68, who is now a special assistant in placement at Radcliffe. . . . **Dick Storat**, Course XXII, writes that his wife Sue just delivered their third boy, Gregory. The others are Todd, six, and Keith, five. Dick is teaching modern physics at West Point. . . . **Herbert Schulze** is in his final year at University of Chicago Law School.

I was very sorry to learn that **Roy Bruce Lindorf** died on September 11, 1969, in a plane crash in central Nevada. Bruce entered M.I.T. in September, 1961. He majored in electrical engineering and was a member of the M.I.T. Crew Team. In 1963 he left M.I.T. for a two-year stay in Sweden. He returned in 1965, completed his studies in electrical engineering, and received his degree in June, 1967. Since then Bruce had been pursuing graduate studies at Stanford University. On behalf of all classmates may I offer my sympathy to Bruce's loved ones.—**Jim Swanson**, Secretary, Services Provinciaux, Beni-Mellal, Morocco

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What class are you in? This may seem to be a rather simple question, but many members of the Class of '68 did not receive degrees in June 1968 for various (selective) reasons. The default condition for class affiliation is the year you receive your degree. Thus if you received your S.B. after June, 1968 you will be automatically included in the Class of 1969 (or '70). The only exception I know of is Course 6A which has a long established five-year program. Luckily this default condition is easily corrected. Just drop a card to me or the Alumni Office. If in doubt about your situation, drop a card anyway and I'll get it straightened out. Now, you ask, what are the advantages of being affiliated with the Class of '68? Well, it is your Class. All notes you send to the Alumni office will be forwarded automatically to the correct class secretary (me) so you can see your name in print in this very column. You'll get invited to the right reunions when that time comes. Finally you have the honor of receiving notes from Jerry Grochow, our very own class agent (if your affiliation is wrong, you'll still get notes, but from some other class agent). Now having handled that administrative task, let's get on to more interesting matters.

Nuptial Notes

This month seems to be full of wedding news. As is the custom, coeds will get top billing so I am happy to report that **Carolyn Henry** was married to **Gary Bjorklund** on November 9 in Euclid, Ohio. Carolyn had been studying at San Diego while Gary was at Stanford. . . . **Susan Weiss** is now Mrs. Susan

Liebman and is living in Rochester, Mass., but I have no further details. . . . **Ron Bohm** has married Katherine Feinbaum, Tufts '70. Ron is still a Ph.D. candidate in the Sloan School. . . . **Lenny Mausner** married Judy Cagan in August and is in his first year of graduate school at Princeton in physical chemistry. Last year he was teaching in the South Bronx. . . . **Edward Norin** has wed Gilda Cowan of Boston and is working as a chemical engineer with Diamond Shamrock and teaching night school at Lake Erie College. . . . On June 21, **Tom Wilson** married Elsie Crowley, '71. Tom writes that he is now the President of High Performance Plastics, manufacturers of small boats, oceanographic instrumentation housings, and chemical processing tanks, all made from fiberglass reinforced plastics.

Mark McNamee married Carole Mattern, a Simmons graduate, on September 21, 1968. Mark is at Stanford working on a Ph.D. in chemistry after having spent four months in the National Guard. . . . **Harold Levin** was wed to Myrna Kachinsky, another Simmons grad ('69), on August 24. Harold is now working on a master's in computer science at the University of Illinois while Myrna is teaching sixth grade in Urbana. . . . **Paul Hyman** married Diana Cynamon on December 20 and is now studying at the State University of New York Downstate Medical Center for an M.D. . . . **Dick Grubic** reports that he has married the former Linda Hoglund. After working for Boeing for a year he left and formed his own company, Interface Research, and is also studying physics at the University of Washington. Dick also reports that **Tom Chester** has married Dawn. . . . **Robert Loveless** was married to Diane Holmes, a B.U. graduate, on January 25, 1969 and is now a second year T.A. in physics at Cornell. . . . **William Harris** married Betsey Foster, another B.U. grad, on December 28, 1968 and is now teaching history and biology at Boy's Latin School in Baltimore. . . . Finally, **Gerry Banner** has married Louise Morris, a Jackson graduate. Gerry is now a T.A. in the M.I.T. Operations, Research Center and the Varsity Golf Coach at the Institute.

Selective Service Stories

Ron Suffers has enlisted in the Air Force and is stationed at Lowry A.F.B., Colorado where he is training in the field of photography. . . . **Bob Haslam** writes that he is an "indentured servant with the U.S. Air Force." Bob is at the Satellite Test Center in Sunnyvale, Calif. and expects to be out in four years. . . . **James Bayley** wasn't lucky enough to be sent to California, he's in the Photographic Section, Public Information Office, 20th Engineer Brigade, South Vietnam. . . . **Jack Rector** has finished carrier qualification for Naval Aviator Training and is in Corpus Christi, Texas for advanced training. Jack and Bonnie report the birth of a daughter, Kimberly, in May. Congratulations. . . . **John Cleary** has completed four months of army reserve training which he describes simply as a

"horrible experience." He's now back at Yale continuing grad study in economics. . . . **Paul Miller** reports that he is now Ensign Miller and is attached to MCN 40 in Davisville, R.I. . . . Finally **Kurt Gustafson**, who was in Course XIII-A, reports a busy military career since he left the Institute. From January to February he was on an inspection trip in the Philippines and Vietnam on navy patrol craft. In March he traveled to Guyana, South America, as a salvage advisor. Finally, during August and September he salvaged the S.S. Alamo Victory which was beached in Gulfport, Miss., after hurricane Camille.

Rick Rudy is working as a manufacturing management trainee (a two year program) with G.E. He is presently assigned to the Medium Steam Turbine Generator Department in Lynn and is still active with the M.I.T. G & S Society. . . . **Jacob Bernstein** is a research associate with the Sleep and Dream Lab at Boston State Hospital where they are studying the long-term effects of tranquilizers and sleeping pills on "normal" physiological sleep. . . . **Ron Rosen** writes that he is happily at work teaching physics and math at the Sterling School, a Grade 9-12 boys school in the "snow zone" of Vermont. Ron is also running the school's Outing Club and as of October had already made four trips to the White Mountains and Green Mountains. . . . **Leonard Schrank** is at the University of Wisconsin going for a master's in computer science. He currently is undecided about going on for a Ph.D. or stopping now. . . . **Reynold Martin** received an S.M. in Course XX in September and is a Development Engineer at the National Starch and Chemical Corp. in Plainfield, N.J.

Herb Finger is living with **Dave Kaye**, **Steve Swibel**, **Steve Kanter**, and Roy Gamse, '67. They're all at Yale Law School. **Irving Joffe's** wife Elga was recently featured in an article in *The Jewish Times*, a Boston weekly, on how sighted people can help blind people. Elga was a psychology major at Stern College at Yeshiva University and is a group worker at the Boston Aid to the Blind Center. Irving is a T.A. in the Brandeis University chemistry department. . . . **Scott Marks** received an S.M. in June and moved from Eastgate to Watertown. Scott is now working for

Arthur D. Little and his wife, Pam, is still working at the M.I.T. Computer Center. . . . **Roger O Dell** is in the second year of the Master of City Planning degree program at the University of Pennsylvania. Last summer he worked at the Transportation Research Department at General Motors Research Laboratories studying future transportation concepts and developing transportation planning science. He writes, "I am keeping busy as an R.A. and as Vice President of the Graduate Student Council. Pleasant memories of my years in the M.I.T. Glee Club are brought back as I sing in the Pennsylvania Choral Society."

Steve Finn received his S.B. and S.M. in June and is still a student, working on a Ph.D. at M.I.T. . . . **Mike Rodbury** was named in August to the *Harvard Law Review*, an honor which goes to the top 20 students on the basis of first-year grades. . . . If you look on page 367 of the M.I.T. Catalogue you'll see that one of our classmates has made the inner ranks of the M.I.T. Administration. After receiving an M.A.T. at Harvard, **Rich Adelstein** is now Special Assistant to the Provost. He is working with Dr. Wiesner and Professors Rosenblith and Gray on coordinating all urban related programs at M.I.T.

I was nominated in October by the Graduate Student Council to the Standing Committee on Special Laboratories which was established after the Pounds Report. This committee is charged with reviewing new programs at the Special Laboratories and implementing the guidelines proposed by the Pounds Panel. This looks like it will be a challenging task and I'm sure you'll hear more about this committee. Unfortunately, since events happen so fast on the campus, it would be inappropriate to comment on the work of the committee in a column such as this which has a very long lead time. It's amusing that some people see my appointment as proof that I am a radical while others say it proves I am a Y.A.F.er. Neither of these conclusions are correct. So much for this month. Remember to drop us a line if you're in doubt about your class affiliation; if you're not in doubt—you can write anyway.—**Gail and Mike Marcus**, Secretaries, Eastgate Apt. 16A, 60 Wadsworth St., Cambridge, Mass. 02142

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Three of our classmates have been selected for Atomic Energy Commission special fellowships in nuclear science and engineering. **Raymond L. Eng** has begun graduate study at M.I.T. while **Donald E. Uhl** and **James Sicilian** have commenced graduate studies at Stanford University. Sixty-nine first-year N.S.E. fellows were selected from a total of 290 applicants. The program is administered for the A.E.C. by Oak Ridge Associated Universities, an educational and research corporation of 41 Southern universities and colleges.

I also have two marriages to report. **Michael J. McNutt** exchanged vows with the former Miss Barabara O'Reilly of Cleveland on November 15, 1969. Both Mike and Barb are working as graduate assistants and attending classes at the University of Illinois. . . . **Roger Chang** married the former Miss Lula Chin of Bronx, N.Y. Following his commission as a 2nd lieutenant in the regular army, Roger was assigned to graduate civil schooling at the University of Michigan for two years.

As for other news, I have the following items to report. **Neal A. Carlson**, Course XVI, is working as a systems analyst in Aircraft Hazards Avoidance Programs at the N.A.S.A. Electronics Research Center in Cambridge, Mass. . . . **Alan L. Davis**, is studying towards his Ph.D. in computer science with special interests in graphics and small interactive computer systems at the University of Utah. Alan is also working as a research assistant and is teaching compiler theory while attending classes.

Thomas J. Lamb is in graduate school at M.I.T. while working as a research assistant. . . . **Iacovos A. Vasalos**, Course X, has joined the Research & Development staff of American Oil in Whiting, Ind., as a chemical engineer. . . . **Mark A. Wuonola** has enrolled in the Harvard Graduate School of Arts and Sciences as an N.S.F. fellow in chemistry. Mark is studying for his Ph.D. under Professor R. B. Woodward.—**Richard J. Moen**, Secretary, 312 Shaw Hall, Cambridge, Mass. 02138

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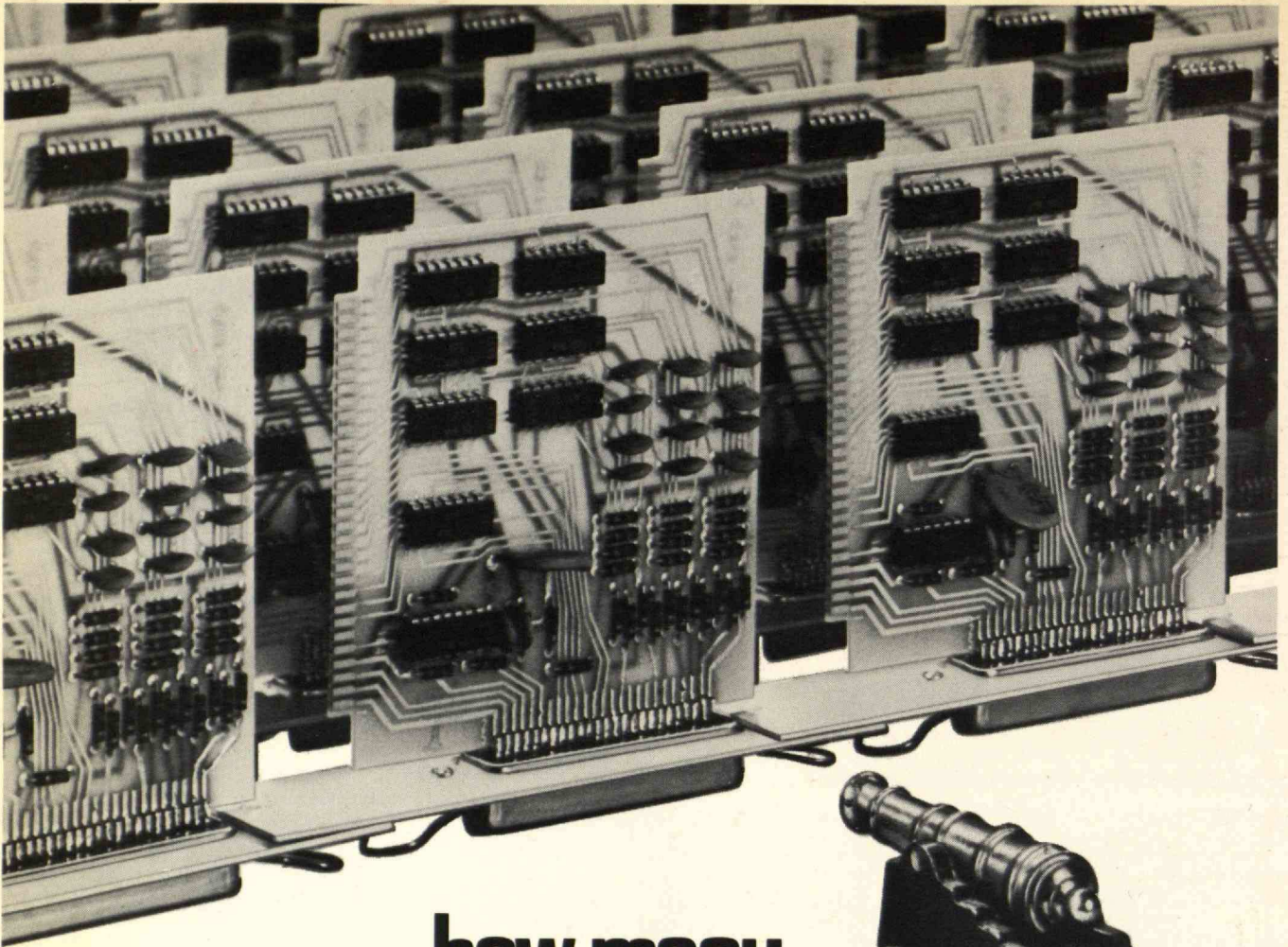
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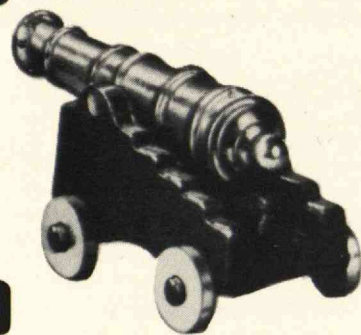
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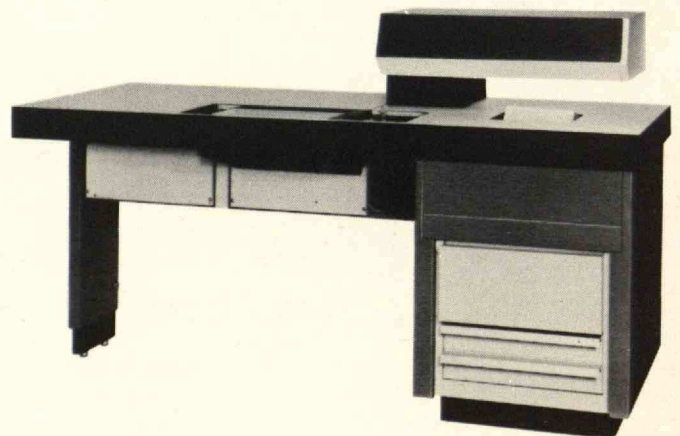


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